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New York, November 10, 1928

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Copper Goes to Sea in Large Quantities

SIX four-day liners will soon be constructed in the United States, which will require about 2,750,000 pounds of copper apiece. This will represent in the aggregate about 16,500,000 pounds for one new fleet of American ships.

According to a writer in a recent bulletin of the Copper & Brass Research Association: "The amount of copper and its alloys used in a modern cruiser or battleship runs into several thousands of tons. No other metal of reasonable cost has been found to compete successfully with copper in the electrical field. A modern battleship equipped with electric drive will generate enough power to supply the needs of Atlantic City. This power is distributed to the various parts of the ship by many miles of copper wire."

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ENGINEERING AND
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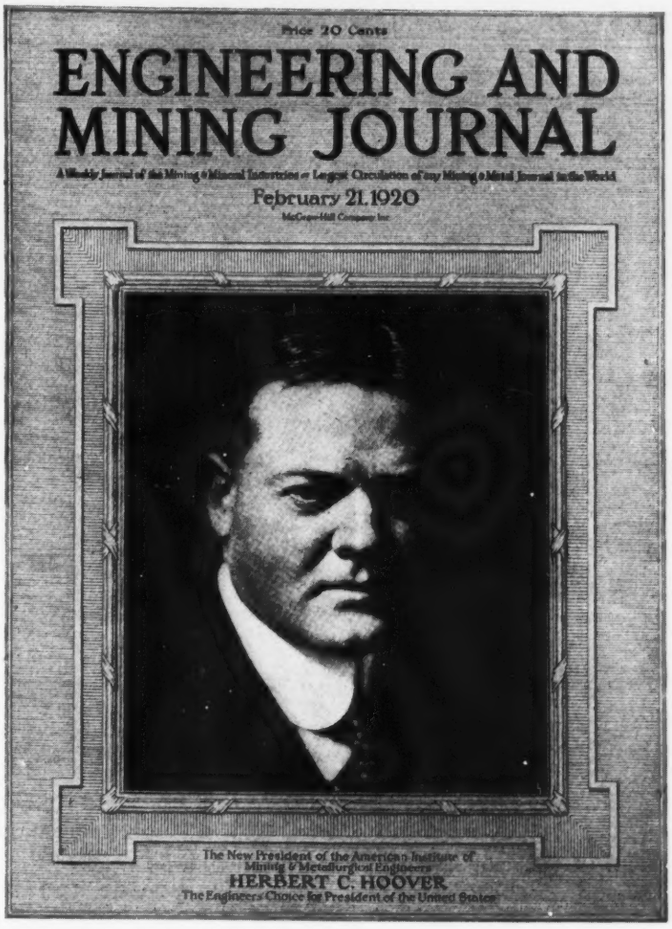
McGraw-Hill Publishing Company, Inc.
JAMES H. MCGRAW, *President*

A. W. ALLEN,
Editor

VOLUME 126 — *New York, November 10, 1928* — NUMBER 19

The President-Elect

HEREWITH is reproduced the front cover of *Engineering and Mining Journal* for February 21, 1920, when, under the leadership of Mr. J. E. Spurr, its editor, Mr. Herbert C. Hoover, at that time elected president of the American Institute of Mining and Metallurgical Engineers, was mentioned as the engineers' choice for the Presidency of the United States. During the intervening period, leading up to the election day of November 6, 1928, Mr. Hoover has continued to be an outstanding figure in the business and social progress of the nation as a whole; and as a fitting consummation to a service to industry and humanity, which had narrowed from international to national scope since war days, he now becomes the choice of that great majority of the electorate of the United States, in every walk of life, necessary to insure the election of a Chief Executive. *Engineering and Mining Journal* tenders to the people of the United States its congratulations in having secured the services of one who is eminently worthy of so great an honor. It tenders to Mr. Hoover, supplementing felicitations on his success at the polls, a reiteration of expression of that high respect and admiration with which he is held by members of the profession and industry of mining engineering at home and abroad, coupled with a tribute of loyalty to him personally, and confidence in his power to fulfill the manifold obligations associated with the greatest task that can be allotted to any single individual. Mr. Hoover's activities since 1914 have focussed on him the attention of a world awakening to the need for a more orderly conduct of national affairs and international relations. His critics have been numerous, but none has been able to sustain objection to the contention that he exemplifies, to the highest degree, the ideals of service, efficiency, and sympathy. If the recent past may be taken as an augury for the immediate future, the people of the United States may believe with confidence that every worthy and needed reform will be fostered by the incoming President; and that all the resources of science will be drafted for the good of the country as a whole, and for the benefit of the professions and industries that contribute constructively to national progress. The electorate has spoken in no uncertain voice. Engineers will see in Mr. Hoover's election a tribute to those characteristics of order and intellectual honesty associated with the best traditions of their profession. Mining engineers whose work takes them abroad will no longer fear reproach and suspicion as to their patriotism. Mr. Hoover's breadth of experience and international outlook will prove an asset of great value to the country during a period in history when prosperity and happiness will depend so much on rectitude and sympathy in high office. His election will carry a new spirit of promise to those abroad who also know of his fine personal qualities and outstanding executive ability.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ENGINEERING AND
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February 21 1920
The New President of the American Institute of
Mining & Metallurgical Engineers
HERBERT C. HOOVER
The Engineers' Choice for President of the United States

THE RECORD OF A GREAT

HERBERT CLARK HOOVER—mining engineer, scholar, writer, administrator, patriot, humanitarian, world citizen—was born at West Branch, Iowa, Aug. 10, 1874, of French Huguenot and English stock, his father being a blacksmith and his mother one whose spiritual leadership was an inspiration to others in the Quaker community in which they lived. Left an orphan at an early age, young Hoover joined an uncle at Newburg, Ore., where he attended the Pacific Academy, later moving to Salem, in the same state, where a chance meeting with a mining engineer led to a decision to follow that profession. With diligence and determination he worked his way through a course at Stanford University, graduating in 1895, being associated in his undergraduate days with the Arkansas Geological Survey and the United States Geological Survey. Between 1896 and 1914 the call of his profession necessitated extensive travel throughout the world and residence in foreign countries, in the organization and direction of mining and railroad enterprise, particularly in Australia, China, Mexico, Alaska, Russia, and India. During this period his accumulating experiences and the development of a generous spirit toward his confrères led to significant contributions to the common fund of information on engineering practice, it being interesting to note that his first article, on "Geology of the Four-Mile Placer Mining District, Colorado," appeared in *Engineering and Mining Journal* of May 22, 1897. "Principles of Mining" was issued by the Hill Publishing Company, New York, in 1909. With Mrs. Hoover he acted as co-translator and commentator of Agricola's "De Re Metallica," a monumental task that was completed in 1912.

Herbert Hoover

At the outbreak of the World War Mr. Hoover abandoned professional work and generously gave his entire services to facilitating the return of fellow Americans stranded in Europe. An exceptional ability to deal with emergencies and crises becoming apparent, coupled with administrative and engineering skill and tact that attracted wide attention, he was appointed chairman of the American Commission for Relief in Belgium—a vast undertaking to succor suffering humanity, the ramifications of which ultimately extended throughout all the Continental belligerent countries of Europe. In 1917 he was appointed Food Administrator by President Wilson, carrying through to the end of the war period a program of applying those ideals of service and method that had already won respect and admiration. Postwar relief problems in Czechoslovakia, Germany, Austria, Esthonia, Finland, Latvia, Lithuania, and Yugoslavia were solved by the application of a fine blend of humanitarianism and efficiency. In 1921 he was appointed Secretary of Commerce by President Harding, bringing to that department a skill and purpose and stimulating a loyalty and zeal among government employees, the salutary effect of which has been appreciated by every branch of American industry.

No other American citizen has contributed so much to place American industry on a scientific basis as has

ACHIEVEMENT

Camel transportation to the mines in the early days of the Western Australian gold fields

Herbert Hoover. Reorganizing the Department of Commerce, Mr. Hoover set up as its objective "the economic welfare of the American people," the promotion of business stability, the raising of standards of living and material welfare. The policy was one of "consistent co-operation, unified effort to attain mutual benefits, and an earnest desire to further all activities looking toward the enhancement of national prosperity."

Marked economies have also been effected in American industry through the service of trade associations and organizations of professional men, many of which owe their wide influence and beneficial results to Mr. Hoover's encouragement and co-operation as a government official and that genius for leadership which he so strikingly exemplifies and which all the world has learned to appreciate and applaud.

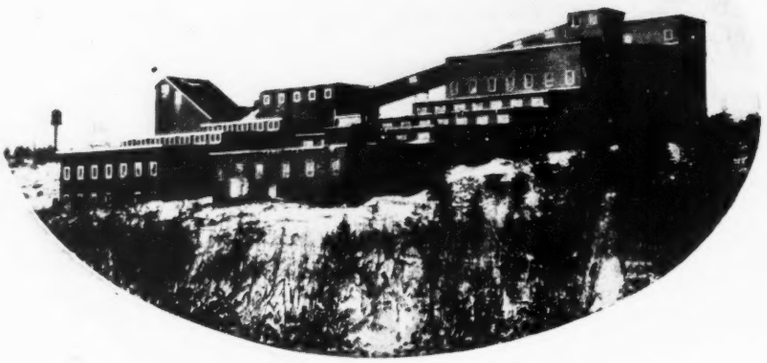
Space forbids a recital of the honors that have been conferred on the President-Elect and of the positions of dignity and influence he has held at various times and still holds. As a past president of the American Institute of Mining and Metallurgical Engineers he reflects purpose and character to the profession and industry covered by *Engineering and Mining Journal*. As contributing to humanity, science, commerce, and the economic life of the nation, he directs and counsels the course of a bewildering number of philanthropic, economic, and industrial activities. From threescore universities and colleges he has received an honorary degree, but the crowning tributes to his staunch Americanism and service to his profession, to the country, and to humanity at large came when by popular vote he was elected to the Presidency of the United States on Nov. 6, 1928.

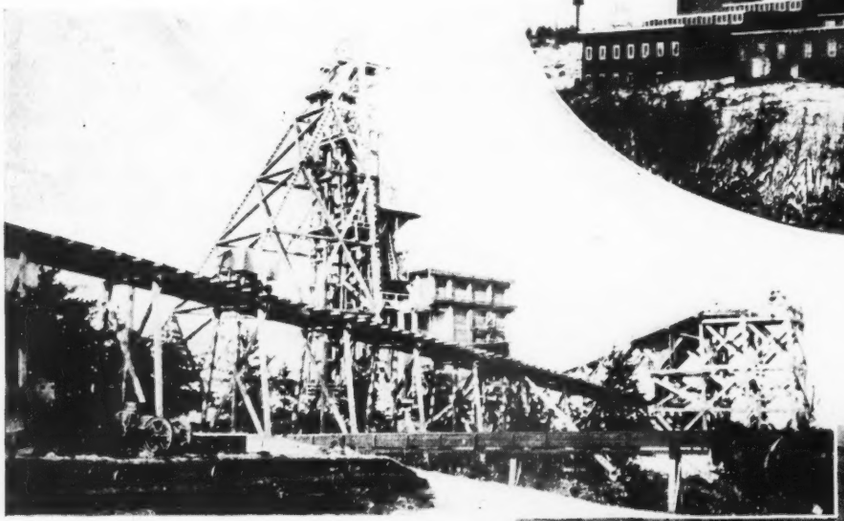
Scene on the Namtu River, Burma

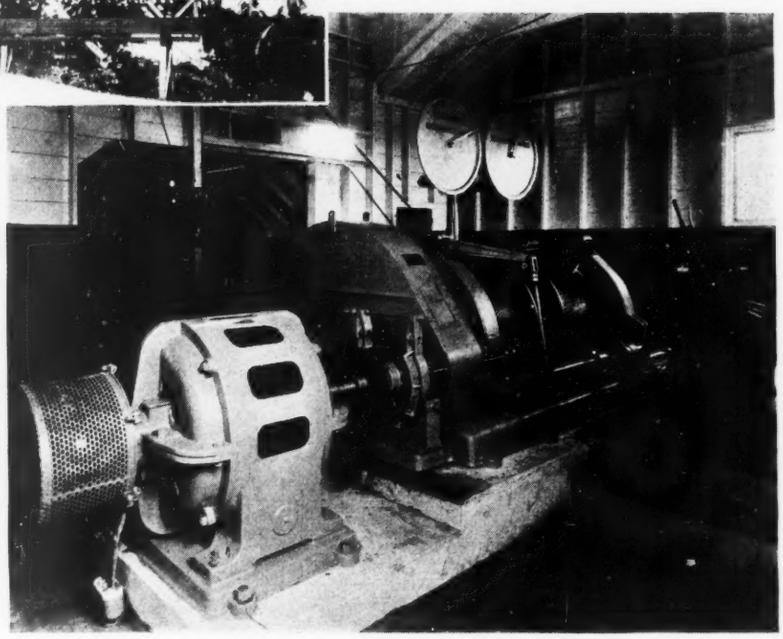
A Pioneer Effort to Mine

Oval, The Porcupine Paymaster Mill. Left to right, the crushing department, the cyanide plant, and the new concentrator.

Above, Surface plant of Porcupine Paymaster Mines, Ltd., from roof of cyanide plant.







Above, No. 3 shaft and bins. The ore is transferred over the incline to the crushing plant. Right, the hoist at No. 3 shaft.

Low-Grade Ore in Ontario

The Porcupine Paymaster Project

By A. H. HUBBELL
Associate Editor

OPINION in the Porcupine district and elsewhere has been divided on the question of whether or not an ore as low in grade as that occurring in the Porcupine Paymaster property could be mined and milled at a profit in northern Ontario. Some have said "Never," having in mind the higher costs prevailing elsewhere in the district, which required a richer ore; also the fact that it has not as yet been done—a circumstance always conclusive to the pessimist. Others, recalling such low-cost producers as Alaska Juneau and Miami, have asked "Why not?" In this broad attitude of mind they have been supported by the knowledge that geological conditions at the Paymaster are rather different from those obtaining elsewhere in the district, and that, in consequence, it may be entirely possible to mine there on a larger scale at a lower unit cost. Added to these influencing factors have been the genial self-assurance of H. E. Clement, until recently the manager of the property; his abundant confidence in the ultimate outcome of the enterprise, and the numerous evidences of his ability and efficiency to be seen about the plant.

ORIGINAL SCHEME BOLD AND DARING

The gold content hitherto ascribed to the Paymaster ore is $2.65 a ton or thereabouts, this being the average of all grades that it had been planned to work.[1] Since my visit to the property last June, however, the change in management has taken place, and it is stated that the company now intends to mine only the higher-grade portions of the ore. This is an entirely different program, the outcome of which, if it is carried into effect, cannot be forecast. It will undoubtedly call for radical changes in the company's plans and will scarcely permit large-scale low-cost operation. Such a modification, nevertheless, will present a problem that is no more than commonplace. The original scheme aroused much interest because it was bold and daring. To that scheme I shall direct my attention in this article.

Up to the time of the change in management the question presented in the opening paragraph above had not been answered. Further work remained to be done. Certain difficulties in the concentrator had been encountered, the solution of which was still unfound. Once this were reached, however, it seemed likely that the tonnage already shown to exist by underground development could be extracted and treated at a figure that would permit a profit, assuming a $2.65 ore.

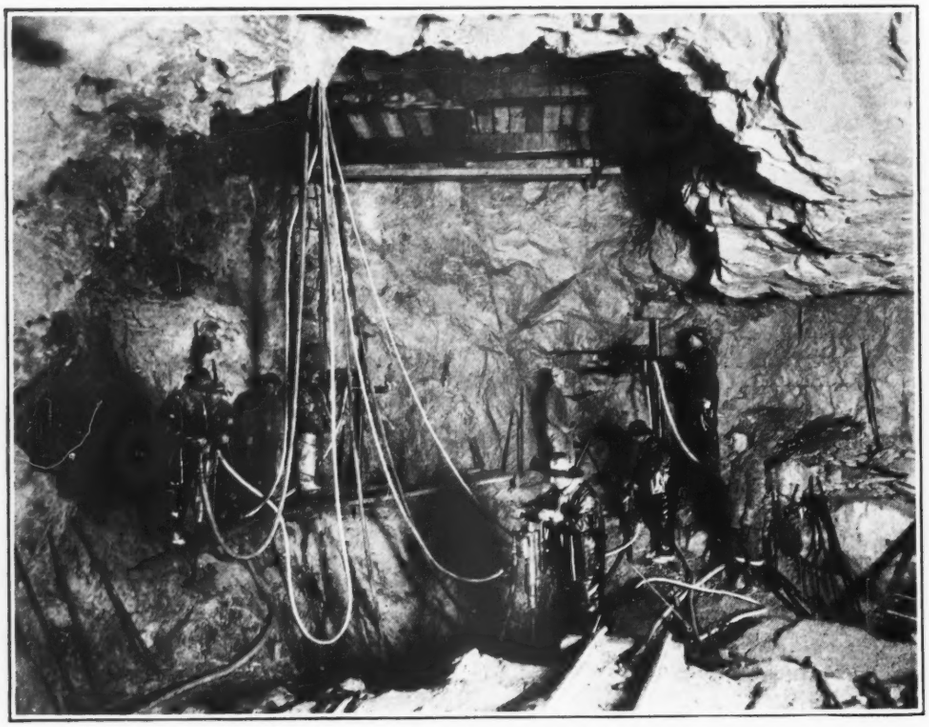
[1]The present management has announced that the average grade is lower than this.—EDITOR.

Geological conditions different to those prevailing elsewhere in the district are found over a large part of the Paymaster holdings. The property was reported on by several engineers between 1923 and 1927. The ore-bodies on the existence of which the enterprise has been based consist of large masses of feldspar porphyry, which is persistently mineralized with disseminated gold pyrite. These occur in a rock that has been styled a serpentine. In addition to the disseminated pyrite, occasional "plums" are found, consisting either of free gold, with quartz in narrow stringers, or of concentrations of the auriferous pyrite. The project, however, has been founded on the hope of extracting the gold in the disseminated sulphide.

All this is quite different from the way in which ore occurs elsewhere in the district. Those familiar with Porcupine geology know that the typical deposit is a vein or a system of veins, carrying auriferous pyrite and free gold and occurring in Keewatin greenstone schist in close relation to intrusive bodies of porphyry. The fractures in which the vein filling has been deposited may pass into the porphyry from the schist, but, when this happens, the amount of gold in the vein matter decreases. The porphyry itself, outside of these low-grade continuations of the veins, is barren. It is in this respect that the geology at the Paymaster is radically different. Here the porphyry itself constitutes the ore. Elsewhere the porphyry is worthless. Moreover, the Paymaster porphyry consists principally of feldspar or albite, whereas the typical porphyry of the district is a quartz variety.

POSSIBILITIES OF ORTHODOX OCCURRENCES ALSO

The Paymaster gold-bearing porphyry, and the serpentine which it intrudes, occur in the northern part of the property. On passing to the south, the serpentine is found to change without any well-defined contact into the Keewatin schist with the typical, barren, quartz-porphyry intrusions. During 1924 and 1925 considerable work was done in this schist area, consisting of a short surface adit and drifts on one of the veins, several hundred feet of crosscutting and drifting southwest from the No. 2 shaft on the 300 level, and long south crosscuts on the 400 and 800 levels; also a large amount of diamond drilling from surface and underground. This work on and above the 300 level has shown a fractured and broken zone with an approximate east-west strike in which irregular sections of veins have been found, producing good but erratic values. Typical



The No. 3 shaft from the surface to the 300 level was put through by raising from the 300 level with a preliminary raise and then milling down and timbering to the full size. The photograph used, however, shows the deepening from the 300 toward the 400 level.

breccia of two of these veins opened on the level and by drilling is important evidence of movement and of a locus for ore deposition. It was anticipated that the occurrences might be less erratic if opened up beneath this area at greater depth, and late in 1927 a drift was started on the 800 level and run west from No. 2 shaft, carrying it well past the No. 3 shaft to be used as a base for crosscutting and diamond drilling. Preparations were also made for further development on the 300 level. It was believed that at some future time the vein ore, being higher grade than the porphyry, would serve to sweeten the mill heads and in this way become an important source of revenue, but this, though considered advisable, was not depended on for the success of the enterprise in planning the scheme originally.

Although some gold-bearing veins have been found in the vicinity of the porphyry, the ground in this section is badly broken, and no vein continuous for any distance has been discovered. The shattered condition of the ground reported to exist, although it offers possibilities as to ore deposition, nevertheless will inhibit mining at a low cost on a large scale. This section of the property was not included in the scheme of operation that until recently was projected.

The scheme of operation, as planned by Mr. Clement, provided for the following:

Station at 300 level of No. 3 shaft after work of enlarging and timbering had been completed. See illustration above.

1. Mining the porphyry orebodies on a large scale at a cost of approximately 60c. a ton.

2. Concentrating the entire output, after grinding to 40 mesh and classifying, on tables, in a ratio of ten to one. The table sands were to be used eventually for stope filling.

3. Cyaniding the concentrate, thus produced, after grinding it. The total cost of reducing ore to bullion also to approximate 60c. per ton.

To this end a mining method was developed that, according to Mr. Clement, made it possible to break at times as much as 100 tons per machine shift. His calculations, however, were based on a figure of 60 tons (not including stope preparation.) A three-unit concentrator, to handle 500 tons per unit, has recently been built, two of these units being completed and the third partly finished. One unit was started on May 7 last, handling 300 tons per day. Ultimately this plant was expected to reduce 1,500 tons of ore containing 8 to 8½ per cent sulphide to 150 tons of concentrate containing 93 per cent of the sulphide. The concentrate was then to be treated by cyanidation in a 350-ton plant together with sufficient crude ore to bring the tonnage up to the mill's capacity. The cyanide plant was placed in operation in May, 1926, and for two years it ran only on crude ore, until recently, when the concentrator was started. It is understood that this was the first cyanide mill to adopt double filtration and intermediate re-pulping. The general design and flow sheet was made by B. D. Kelly, of Timmins, Ontario, who had previously published an article in the *Engineering and Mining Journal* of Oct. 11, 1924, pages 569-573, outlining this variation from usual practice.

How the Property Is Opened

Two shafts, Nos. 2 and 3, are in operation. No. 2, sunk to 830 ft. (30-ft. sump), is the older and is equipped for handling men and supplies. Prior to the completion of No. 3 shaft, it served all operating needs. No. 3, through which all ore is hoisted and which, unless plans are further changed, will be the main working shaft, is sunk only to 400 ft. at the present time. This is quite sufficient, however, as all stoping and development work done to date lies between the 300 level and the surface. Below the 300-ft. elevation only exploratory work has been going on. Considerable diamond drilling has been done—in all about 40,000 ft.

Five of the mineralized porphyry deposits have thus far been discovered in the serpentine. In the largest of these, spoken of as the Main or No. 1 orebody, the bulk of the tonnage of ore developed to date exists. This deposit has been shown to have a length of 700 ft. on the 300 level and an average width of 100 ft. It has been cut in a drill hole at a depth of 800 ft. and on the 400 and 600 levels has been opened by crosscutting and drifting. All of the present stopes are located in this deposit. The other orebodies, all lying within easy tramming distance of No. 3 shaft, are reported to have widths varying from 100 to 140 ft. If they, on further development, should prove equal in tenor to No. 1, they would constitute a reserve of milling ore above the 300 level many times that already developed. It had been realized that no doubt there would be certain portions of all the bodies not of minable grade; a considerable block in the west portion of the No. 1 body had not been included in the estimate of available tonnage, and such exclusions would probably have to be made in all the bodies. However, with the method of mining adopted, it was thought that these areas could easily be avoided and left in place.

The Mining Method as Developed Under Mr. Clement

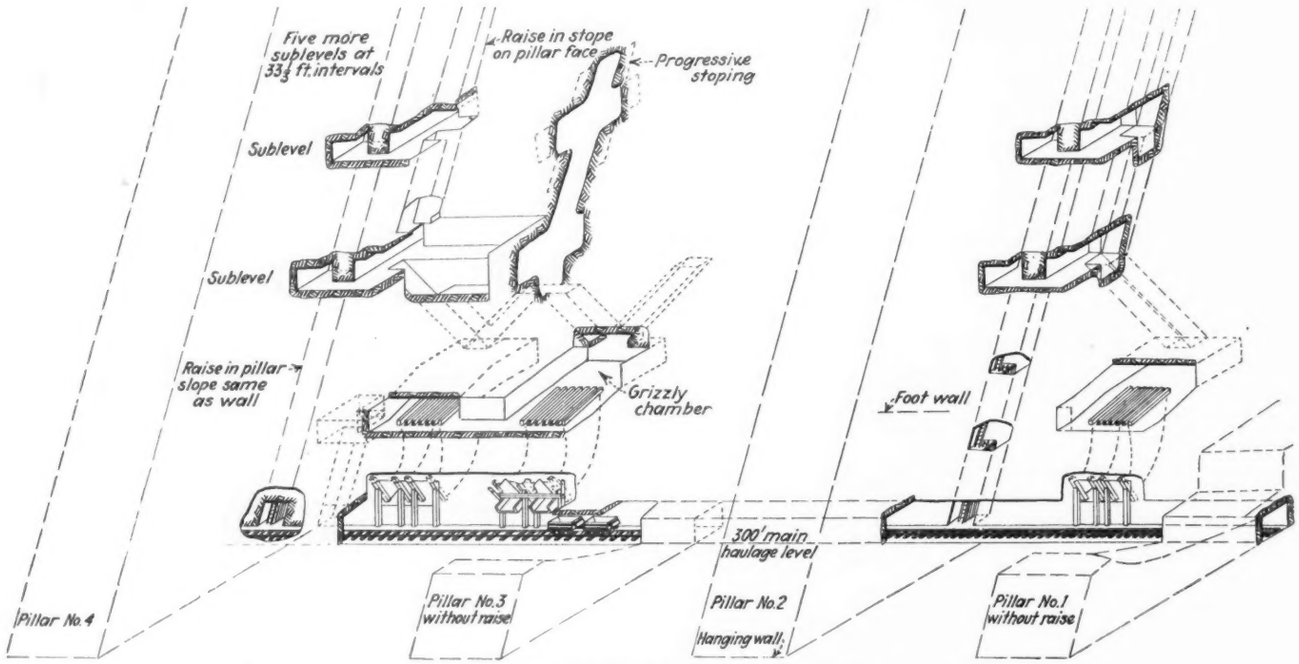
A system of mining, variously referred to as sublevel stoping, underground quarrying, or mill-hole mining, has been developed in the No. 1 deposit. The dip of the body is 60 deg. Stopes are laid out along the strike, separated by 30-ft. pillars, the stope width (between pillars) varying from 60 to 100 ft. The recent trend has been in the direction of wider stopes. In the course of working out this method, it has been modified repeatedly to adapt it to local conditions as well as by way of experiment. Although it was worked out independent of precedent, it may be said to have several features in common with sublevel mining as practiced in a few of the iron mines, but the method of opening up is entirely different, and the amount of stope preparation before mining can begin is very much less than in other methods. Ideally, the method is as follows:

In the center of every other pillar a 300-ft. raise is driven on the dip from the main haulage level to the level above (in this instance, from the 300 main haulage level up to or close to the surface, unless previous openings are in the way). This raise is intended to serve as a passageway for men and supplies and for ventilation, and will be equipped with a hoist and skip. Then, on the haulage level, between the pillars and depending on the length of the stope, either one or two double chute raises are put up to a point about 35 ft. above the level. Here above each is built a grizzly of 15-in. girder-type I-beams 16 ft. long, with a flange 11¼-in. wide and weighing 99 lb. per foot, set on a slight slope to assist in moving boulders for breaking. Originally these were spaced 12 in. apart, but when larger cars were placed in use, the spacing was changed to 16 in. Four wear plates of 0.65 carbon steel are bolted on the top of each beam, the plates being made reversible. Around this grizzly a bulldozing chamber about 8 ft. high is cut. The grizzly is shown in the illustration on page 745. The grizzly chamber is entered from a raise at the side of the main drift through a short crosscut.

From the front or higher end of the grizzly nearest the raise pillar, and after leaving a brow over it situated so that the natural slope of the broken ore will strike the grizzly at about one-third its length, an inclined preliminary or stope raise is put up on about a 40 deg. angle until it intersects the pillar, which will be about 60 to 65 ft. above the haulage level. Previously, from the raise in the pillar, at 66⅔ ft. above the haulage level, and at each 33⅓ ft. interval above that, sublevel crosscuts about 20 ft. long have been driven toward the hanging wall and drifts carried from the end of this, right and left toward the stopes on each side. These openings serve as passageways into the stopes and for storing drills, drill steel, and supplies handled by the skip. The incline portion of the stope raise is now connected with the sublevel crosscut, and the stope raise is extended up the side of the pillar and similarly connected to the next sublevel above; and this is repeated to the height of the block, or 300 ft. in this example.

As soon as the preliminary stope raise reaches the second sublevel above the haulage level, or at any time

after that, a side slash starting from the sublevel, 8 to 10 ft. wide and 7 to 8 ft. high, is broken out completely around the raise, one side being usually cut out of the pillar. A portion of the bench thus made, and on the side opposite the pillar, is broken down to the incline section of the raise, leaving the benches on the other three sides for passageways; and as soon as the next sublevel above is ready, this also is slashed around, and the same relative portion of this bench below and above the slash-



Sketch showing method of mining developed at Porcupine Paymaster mine by H. E. Clement and staff. Drawn by Arnold M. Wyman

ing, about 25 ft. in depth and 8 to 10 ft. wide, is broken out by drilling upward with water stopers and downward with hand-held plugger drills, 12-ft. steel being used. The side and end slashing is then carried forward another 10 ft. toward the blank intermediate pillar, and the next end benches are broken out. In this fashion the original stope raise is extended across the stope as a continuous slot to the opposite, or blank, pillar, a distance of 60 to 100 ft.; and as the stope raise is extended to upper sublevels, this slot eventually extends from the grizzlies to the top of the block.

The progressive slashing on each sublevel has left a bench on each side of the slot and at the end next to the raise pillar. The side benches can now be drilled downward from above and upward from below, with about 5-ft. burden on each line of holes, the lines being staggered to assist breaking. In practice at the Paymaster it was thought advisable to extend the stopes first toward the footwall, the hanging-wall portion being left until later. With less solid walls, it might be necessary to leave a hanging-wall slab of the harder ore to support the wall.

Breaking of the lower side benches may begin as soon as the stope raise is well above them, but if they are carried ahead faster than those above, the back will be inaccessible, and the bench overhead must then be broken in two lifts from the sublevel above. This was done to some extent at the Paymaster to advance production. It will be noted that all ore broken in the stope raise or by slashing and benching runs by gravity to the grizzly, and the only shoveling necessary in completely opening up and preparing the stope is in cleaning the benches for drilling. The working faces advance very fast, and any or all of the sublevels can be worked on at the same time. If the slot is 100 ft. long, there is a bench length of 200 ft. at each sublevel, or 1,600 ft. in each stope fully opened up, which would give over 25,000 tons in each stope ready for drilling without column set-ups. The benches constitute nearly 80 per cent of the total amount of ore found in the stopes.

Tonnage per machine shift—60 tons as a basis for calculation, not including stope preparation—has already been mentioned. The 350-ton cyanide plant has been run for considerable periods with two machines per shift (two-shift operation). Powder consumption is 0.3 to 0.4 lb. per ton, as compared with about 1 lb. per ton at other properties in the district.

Eighty per cent extraction of the ore in the stoping block is possible with this method, Mr. Clement asserts. Everything may be taken out except the ground between the haulage level and the slopes of the cone leading to the grizzly, and this cone can be extracted from the next lift below unless it is considered necessary to leave a horizontal pillar or pentice for support of ground or for holding stope filling. It is also probable that some portions of the pillars would be left standing. It has been realized that the use of this method of mining would be confined to orebodies sufficiently hard and consolidated to stand in large openings and to allow benches to be formed by slashing without breaking away.

Advantages of the Method

Among the advantages claimed for the method are the following:

1. Stope preparation cost is low. The width of the orebody makes this cost very small per ton. The amount of work preparatory to stoping is limited. Stoping may be started as soon as the haulage drift is driven, the chute raise and grizzly chamber cut out and the pillar

manway driven so as to connect with the first sublevel.

2. All ore goes by gravity to the grizzly.

3. The stope development is all in ore. Moreover, the amount of narrow openings required for each two adjoining stopes is limited to about 600 ft., which includes the 300-ft. pillar raise and the short connecting crosscut and drifts at each sublevel.

4. The men are always working under the protection of a solid back and on a solid floor. As a safety measure the slot ends of adjoining stopes can be connected at each sublevel by a small drift through the blank pillar, and as the stoping proceeds a passageway bench may be left along each side of and partly cut into the pillar, thus providing a way through both stopes to reach either of two pillar raise manways.

5. Supplies may be readily passed into the stope at 33-ft. intervals.

6. About 75 per cent of the drilling, producing 80 per cent of the ore, is done with one-man drills without a column set-up.

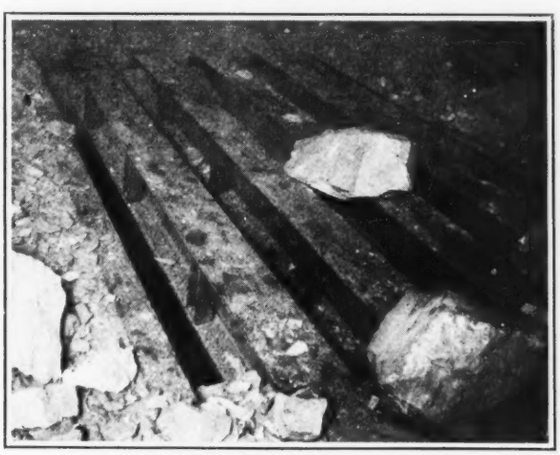
7. No reserve of broken ore in stopes is necessary. Ore may be broken one day and milled the next.

8. By extracting the ore in slices, dilution with wall rock is minimized. As a matter of fact, the walls of the No. 1 orebody stand so well that there is no dilution.

9. All workings have good ventilation, as connection is made with the pillar raise when the first sublevel is reached by the incline section of the stope raise, and thereafter large openings with no dead ends are carried up through the stope to surface or to main levels above.

Besides the fact that the ground stands well, the 60-deg. dip and the uniform mineralization favor the method adopted.

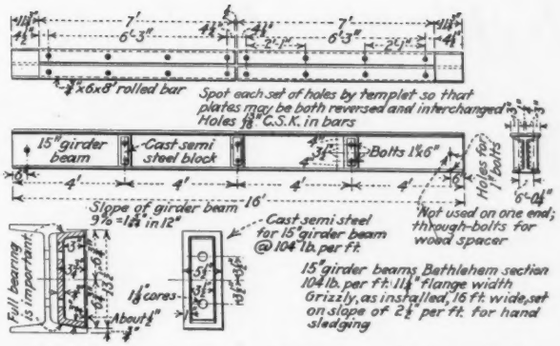
The grizzly bars were first spaced 12 in. apart because small cars were in use and the ore had to be handled in shaft skips and through bin gates to the mill without further breaking. With this spacing the men employed on the grizzlies were paid a contract price of



Grizzly of girder-type I-beams adopted as standard in Porcupine Paymaster mine

15c. a ton. When the three-ton cars were placed in use and the underground crusher was put in operation, the grizzlies were spaced 16 in. apart, and the contract price for this secondary breaking and putting all ore through the grizzlies was set at 10c. a ton, the contractors furnishing their own explosives.

The ore is drawn from the grizzly chutes having underslung gates into 54-cu.ft. ramp dump cars on a 30-in. gage, hauled by storage-battery locomotives in


7'
6'-3"
4'
6'-3"
7'
4'
6"x8" rolled bar
Spot each set of holes by templet so that plates may be both reversed and interchanged
Holes 7/8" C.S.K. in bars
15" girder beam
Cast semi steel block
Bolts 1"x6"
Holes for 1" bolts
4'
4'
4'
4'
6'-0"
Slope of girder beam 9"/0 = 1 1/2 in 12"
16'
Cast semi steel for 15" girder beam @ 104 lb. per ft.
Not used on one end; through-bolts for wood spacer
Full bearing is important
15" girder beams Bethlehem section 104 lb. per ft. 11 1/4" flange width
Grizzly, as installed, 16 ft. wide, set on slope of 2 1/2 per ft. for hand sledging
1 1/8 cores
About 1/4"

Detail of girder-type I-beam used in grizzly

trains of five to seven cars and dumped over a grizzly to the underground crusher, a 30x42-in. Buchanan all-steel jaw crusher, sectionalized to go down the shaft.

Electric Blasting Used

All blasting (save block shooting) has been done electrically by a blaster and two helpers on a special four-hour shift at night, according to the practice hitherto in vogue. Underground operations other than this are conducted on two overlapping (by twenty minutes) eight-hour shifts. The blasters come on duty after the second shift is through, or possibly just before, and load all holes drilled in the two preceding shifts. The firing switch is in the electrician's office on the surface.

Special precautions have been taken to prevent accidents, either from lightning passing down the shaft or from the premature closing of a switch. Leads run from the firing switch down the shaft to the 300-level station, where a 60-amp. square D, 2-pole safety switch (250 volts) is located. Two copper busbars project from the box containing this. Near by and disconnected from the busbars, save just before shooting, are the ends of the permanent leads running into the workings. These leads are No. 8 single conductors (double conductors might be short-circuited by lightning). The No. 8 conductors terminate, both at the station end and at the other end, which is at the base of the pillar raises leading up into the stopes, in 60-amp. rubber-protected test clips. From the base of each raise No. 12 wires are carried up the raise. To these are twisted the cotton-covered wires running from the loaded holes on each sublevel.

Blasting procedure, as developed, has been as follows: When loading has been completed and all circuits have been tested, the blasting crew twist the connecting wires coming from the charges about the No. 12 wires in the raise, doing this on each sublevel, beginning with the highest. At the foot of the raise the No. 12 wires are then connected with the No. 8 conductors by means of the rubber-protected test clips. Falling back to the station, the crew now connect the clips on the other ends of the No. 8 conductors with the busbars of the safety switch and close the latter. Then passing to surface they fire the blast by closing the firing switch in the electrician's office. When this is done no one is ordinarily in the mine. The firing switch used is patterned after one described in the *Explosives Engineer* of January, 1926, with some modifications made by the electrician, A. E. Keats. These consist in the insertion of a pilot light in the circuit of Switch 1 (of the firing switch) and in the fact that the solenoid coil is not wound for continuous service.

(To be concluded)

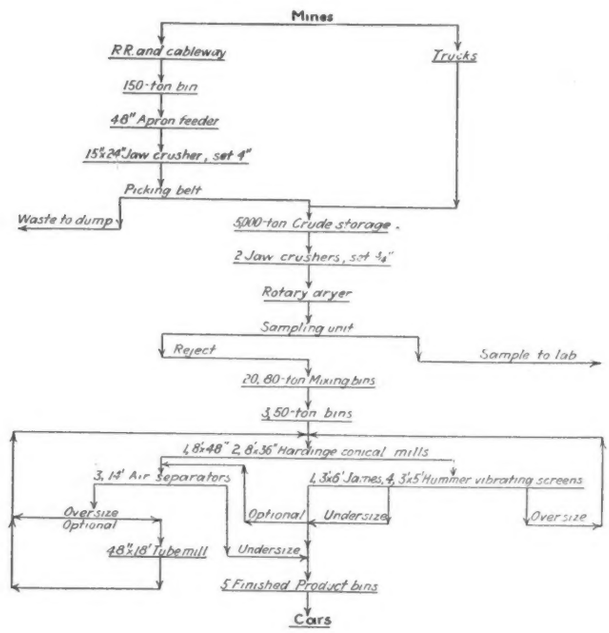
Feldspar Industry Adopts Modern Grinding Methods

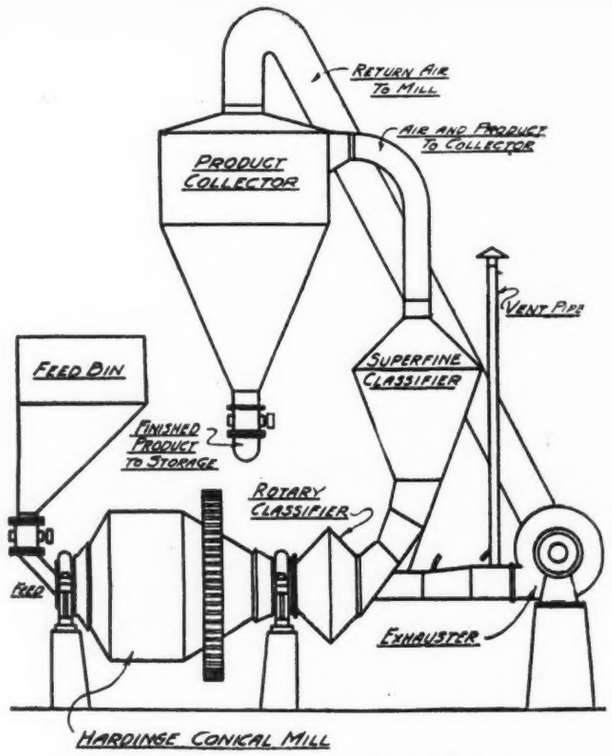
Plant of Tennessee Mineral Products at Spruce Pine, N. C.

ANNUAL consumption of feldspar in the United States is about 200,000 tons, writes F. P. Knight, Jr., in a recent issue of *Chemical & Metallurgical Engineering*. It is used in the manufacture of dishes, sanitary and electrical porcelain, enamel ware, abrasives, terra cotta, glazed brick, glass cleansers, and kindred articles. Almost the entire tonnage is sold in powdered form. The modern method of preparation involves the use of a jaw crusher and Hardinge mills in closed circuit with air separators.

An initial disadvantage of the continuous process was the coarser average particle size it yielded, which difference affected the fusibility of the material. Lower cost and finer air-separator adjustment tended to offset this difficulty, and the introduction of a tube mill in the Hardinge air-separator circuit gave increased capacity commensurate with power input and a finer average particle size. Several different "hook-ups" are employed, and it is obvious that the recent installation of Hardinge unit pulverizers has improved plant conditions.

Flow sheet of improved process for grinding fluorspar





Conical mill used in treating feldspar

The new process is shown in the accompanying flow sheet. Its principal features are:

1. A sorting belt to handle run-of-mine material and to permit selection of the various grades at low cost.
2. A sampling unit that is automatic and efficient.

3. Twenty mixing bins of 80 tons' capacity each. The contents of these bins are accurately ascertained by means of samples taken during filling. The widely varying analyses permit blending to meet any desirable specifications.

4. A Ruggles-Coles drier proved a distinct aid in reducing grinding costs and assisted to secure close adherence to mesh specifications.

Report on Hollinger Fire Suggests Additions to Safety Regulations

THE second part of the report of the Royal Commissioner (Judge T. E. Godson), appointed by the government of Ontario to investigate the Hollinger fire of Feb. 9, has just been completed.

Judge Godson in his report pays tribute to the manner in which the industry in Ontario has been carried on, but points out that with the expansion which has taken place in the industry, and with the much greater depths at which mining is now being carried on, new conditions arise, for which provision must be made. He believes that in framing further regulations it is expedient to maintain and continue the distinct relationship of the operator and the inspector and thus avoid multiplication of rules that might embarrass the operator.

Judge Godson recommends that the Mining Act of Ontario governing the operations of mines be amended by varying it or adding to it in substance the following:

1. That every man employed as an underground foreman (meaning thereby one who is exclusively engaged in supervising the work of other men) shall be able to give and receive orders in the English language.

2. That an Inspector of Mines shall have the right to suspend any foreman or mine captain who is not familiar with or does not understand the requirements or the regulations governing the operation of mines as contained in the Mining Act of Ontario.

3. That the words "above ground" in the first line of Section 161, subsection 11, of the Mining Act be deleted and the section read as follows: "No building for thawing explosives shall be maintained in connection with any mine except with the written permission of the Inspector of Mines. The site of this building and the style of structure and equipment shall be subject to the approval of the inspector. The building shall be under the direction of the manager or some person authorized by him. The quantity of explosives brought into any thawing house at any one time shall not exceed the requirements of the mine for a period of twenty-four hours, plus the amount that it may be necessary to have thawing to maintain that supply."

4. That all underground structures necessary for the installation, maintenance, and repair of machinery and equipment should be fireproof.

5. That all fans except "booster" fans should be placed on the surface and be reversible, and all underground fans should be in fireproof housing.

6. That oil and grease kept underground be contained in suitable metal receptacles and should not exceed one week's supply.

7. That there should be a sufficient number of fire doors at every station where practicable, so that the shaft could be completely cut off from the rest of the mine.

8. That all inflammable waste or rubbish should be taken to the surface.

9. That shift bosses and mine captains should certify at least once a week that there is no accumulation of combustible waste or rubbish underground except as noted, in the area under their supervision.

10. That rescue stations be located at a place selected by the Chief Inspector of Mines in the Timmins, Kirkland Lake, and Sudbury mining areas and be in charge of one man to be appointed by and under the control and direction of the Department of Mines. It should be the duty of such employee to take care of the apparatus, if any, maintained at any such mine.

11. That each station should contain the following, or other equipment to be ultimately determined:

One tool chest; 15 oxygen cylinders—100 cu.ft. each; 1 portable Orsat apparatus for making analysis of mine air; 1 anemometer for measuring ventilation; 1 psychrometer for determining humidity of mine air; 1 maximum and minimum thermometer; 2 cabinets (first-aid) with extra bandages and splints; 4 canaries for testing mine air for carbon monoxide; 2 stretchers; 12 self-contained oxygen breathing apparatus with accessories for testing, repairing, and recharging; 1 pyrotannic acid detector for determining carbon monoxide in blood and air; 5 all-service gas masks with extra canisters; 1 iodine pentoxide detector for indicating amount of carbon monoxide in the air of the mine; 1 geophone; 1 oxygen inhaler for administering oxygen in conjunction with artificial respiration; 1 oxygen pump for recharging small tanks for breathing apparatus; 1 life-line, 1,200 ft. long, used by rescue crews when exploring mines after fires or explosions; 12 electric cap lamps with accessories and charging equipment; 12 approved type flashlights; and 20 bottles for collecting samples of mine air, Cardoxide.

The equipment listed in the foregoing was suggested and put before the commission by the Chief Inspector of Mines at the inquiry held at Haileybury. He was not then able, however, to say definitely that it should be adopted in its entirety. It should be at once reviewed by the inspector and the committee representing the operators and finally determined. The equipment adopted should be used in all stations so that there would be uniformity.

12. That fire protection systems be installed at all underground crushers, tipples, and in dry shafts.

13. That for the purpose of a uniform danger alarm all mines in Ontario should have equipment for pumping into air lines a stench chemical to be selected and adopted by the Chief Inspector of Mines.

14. That readable signs showing the way to emergency exits should be posted in prominent places underground and all men should be instructed where these exits are placed.

15. That the Chief Inspector of Mines may order an underground connection be made between adjoining mines where he deems it necessary for the safety and protection of underground employees.

In this connection, Judge Godson said: "This proposed regulation invades the right of ownership, may involve an expense largely for the benefit of an adjoining property, and otherwise open up contentious questions. While I deem it expedient to recommend it as a safeguard in a remote but possible contingency, there should be a proviso allowing the right of appeal."

A Problem in Mine Ventilation

THE ventilation of a long, single-entry tunnel, so that work can be resumed without undue loss of time after blasting, is a problem demanding scientific planning and the practical application of predetermined data. The use of positive blowers, the proper tubing for the distribution of air and the withdrawal of fumes, the pressures of air needed, and the resistance of sheet-metal piping under partial vacuum—these are a few of the factors that have been studied and applied in practice by Prof. Walter S. Weeks, of the University of California, who has written a helpful and informative article on the subject, which will soon appear.

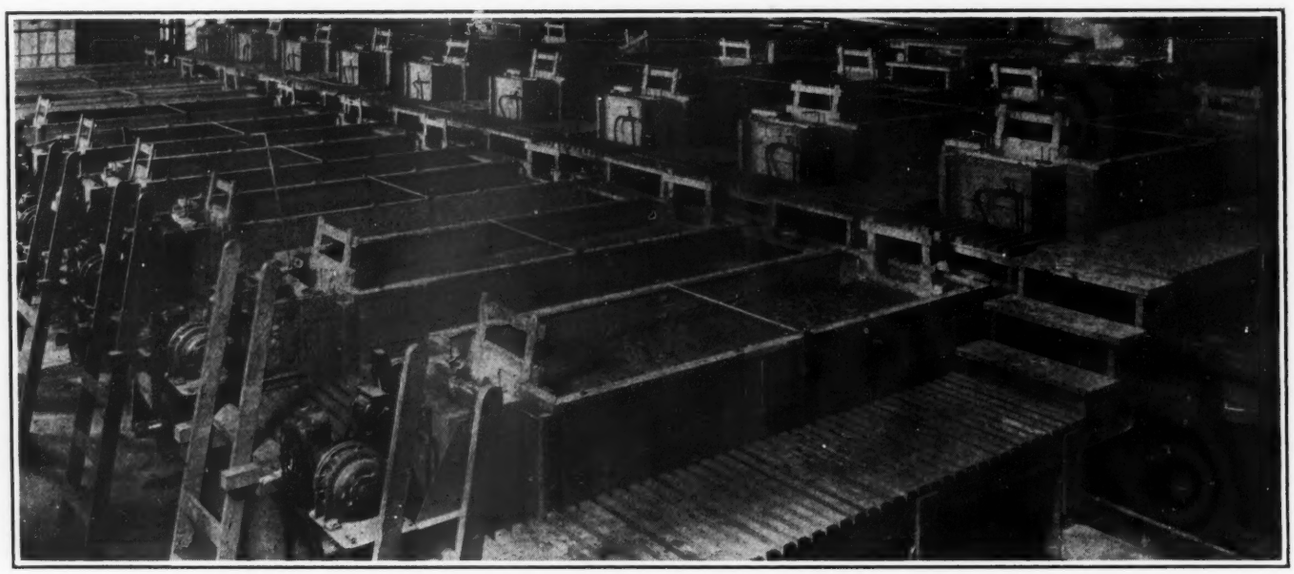
ECONOMIES AND INCREASED PI

Results of Remodeling a Flotation Mill

By H. D. KEISER
Assistant Editor

ECONOMIES in operation and increased production capacity have recently been obtained by the Silver King Coalition Mines Company as a result of remodeling the company's selective-flotation mill near Park City, Utah. The capacity of the remodeled mill is 1,000 tons of lead-zinc-silver ore daily. The flow sheet of the mill is shown in the accompanying illustration.

After the ore is crushed in a No. 6-KD Allis-Chalmers gyratory and a 4-ft. Symons cone crusher, it passes to the grinding section, comprising three ball mills, each in closed circuit with a 6x20-ft. duplex Dorr classifier.



A section of the 28-cell MacIntosh flotation machine installation in the Silver King mill; each machine is driven through a gear reduction unit by an individual motor as shown in the illustration presented on page 750

During capacity operations, feed to the 5x7-ft. Allis-Chalmers ball mill, driven by a 125-hp. motor, averages 450 tons in 24 hours; the 7-ft. x 36-in. Hardinge mill driven by a 100-hp. motor, 360 tons; and the 7-ft. x 22-in. Hardinge driven by a 75-hp. motor, 270 tons. The mills are charged with 3-in. forged chrome-steel balls at the rate of 1.1 lb. steel for each ton of ore ground. Discharge from the ball mills to the classifiers is 65 per cent minus-65 mesh, and the overflow of the classifiers, which has a dilution of 4 to 1, averages 32 per cent minus 200 mesh, 47 per cent minus 80 plus 200 mesh, and 21 per cent minus 65 plus 80 mesh. The circulating load on the grinding section is 2,000 tons.

Twenty-eight MacIntosh flotation machines, each driven through a Foote gear reduction unit by an individual 1-hp. 1,200-r.p.m. General Electric motor, are employed in the flotation department. Twenty of the machines serve as roughers, ten in the lead section and ten in the zinc section. Four are used as lead cleaners and four as zinc cleaners.

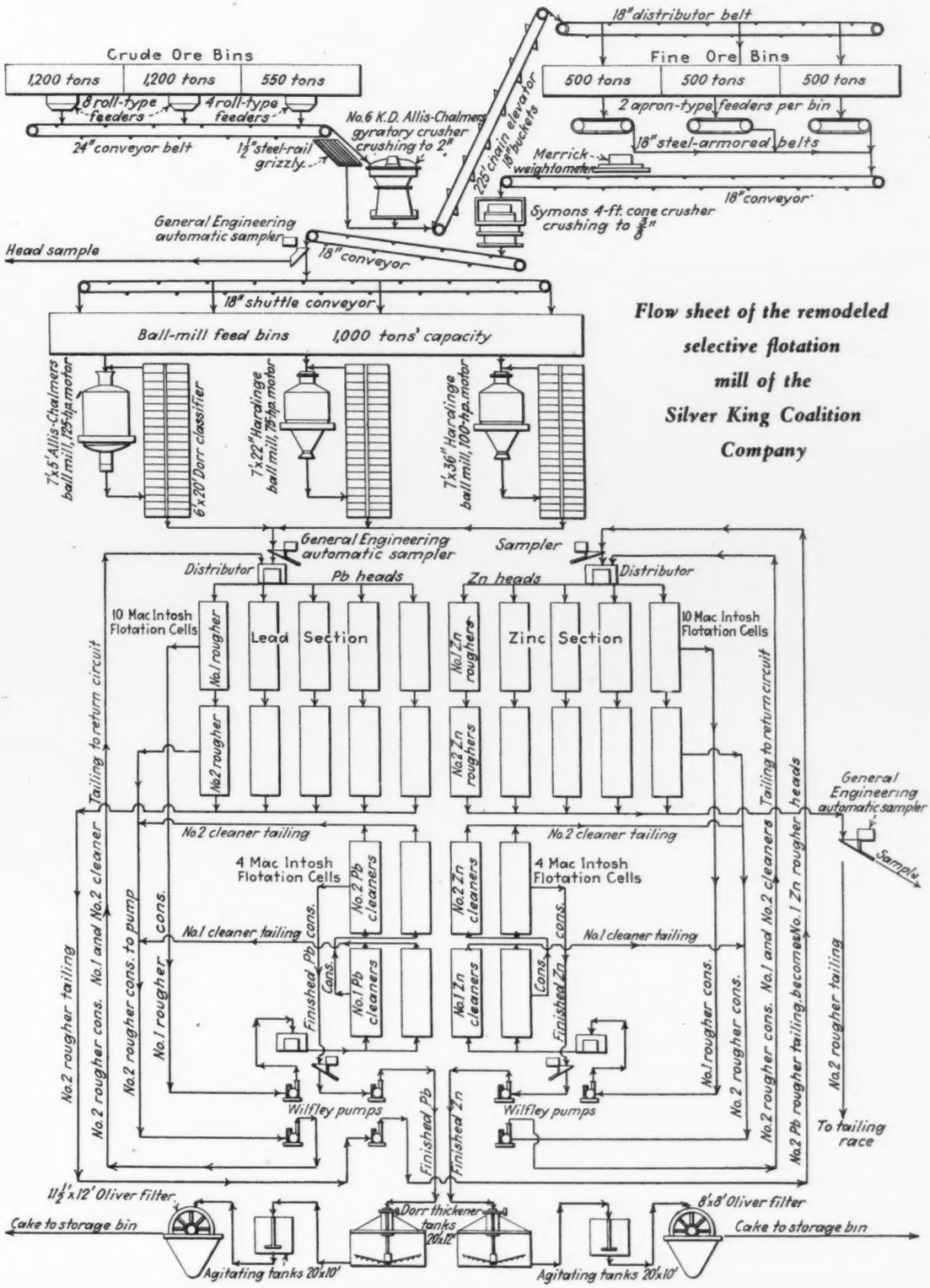
Quantities of reagents used per ton of ore treated, and introduced into the circuit at the ball mills, are: soda ash, 3 lb.; thiocarbanilid, 0.25 lb.; zinc sulphate, 200 c.c. of a 1 lb. per gallon solution; cyanide, 100 c.c. of a 1 lb. per gallon solution; and phosphocresylic acid, 7 c.c. of 15 per cent Aërofloat. At the flotation feed pump, ahead of the lead section, 15 c.c. of Yarmor pine oil is added. In the zinc section 1 lb. of copper sulphate is introduced at the feed pump ahead of the section, and 4 to 5 c.c. of xanthate solution at the distributing tank.

Concentrates are dewatered on Oliver filters. Lead concentrate averages 63.75 oz. silver per ton, 58.48 per cent lead, 12.38 per cent zinc, 3.93 per cent iron, and 10 per cent moisture. Zinc concentrate averages 13.79 oz. silver per ton, 5.56 per cent lead, 53.42 per cent zinc, 4.18 per cent iron, and 8 per cent moisture. These products are shipped to the smelters of the American Smelting & Refining Company.

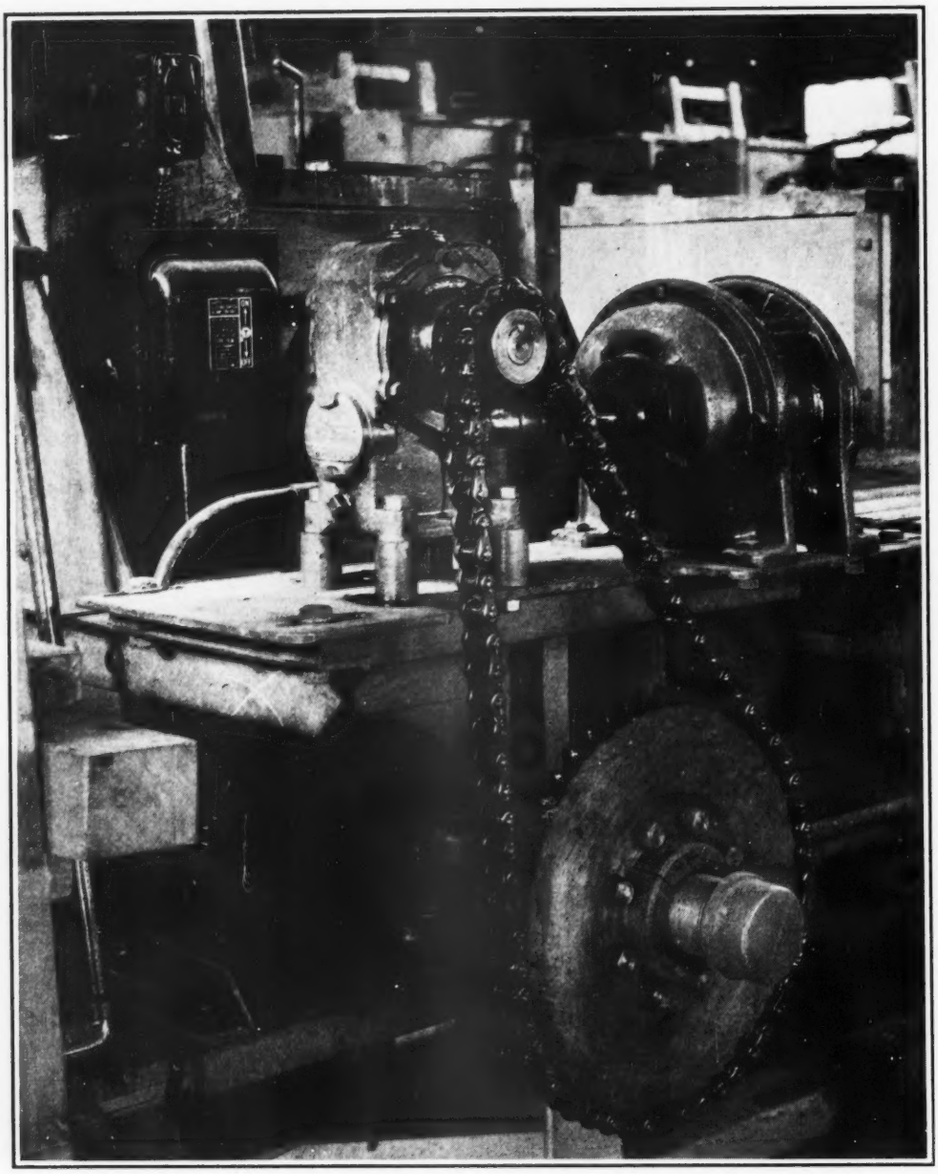
Many applications of the latest equipment and methods are found in the mill. Texrope drive is used on the Symons cone crusher, which is operated by a 75-hp.

PRODUCTION ACHIEVED

at the Silver King Coalition Plant



Flow sheet of the remodeled selective flotation mill of the Silver King Coalition Company



General Electric motor, and each classifier is equipped with the same drive from an individual 5-hp. General Electric motor. The Wilfley pumps have individual motor drives, 10-hp. motors being used with the 2- and 3-in. pumps and 25-hp. motors with the 4-in. pumps. An Ingersoll-Rand vacuum unit serves the filters, and air for the MacIntosh machines is supplied by a 6½-ft. Root blower.

Acknowledgment is made to M. J. Dailey, general manager, Silver King Coalition Mining Company, for permission to publish the foregoing account, and to M. G. Heitzmann and J. A. Tallon, general superintendent and mill superintendent, respectively, of the company, who furnished the information presented.

A "close-up" of the individual drive used on each MacIntosh machine

Pure Manganese Made by Vacuum Distillation

BY A PROCESS of vacuum distillation, the result of research by Dr. F. M. Walters, Jr., Dr. V. N. Krivobok and Dr. J. B. Friauf, pure manganese is now being produced in the bureau of metallurgical research of the Carnegie Institute of Technology. The purified manganese will be used in a comprehensive study of the system, iron-manganese-carbon. Although manganese is widely used in the steel industry, it has never been prepared in a pure form in any great quantity. The ordinary processes of reduction of manganese from its ores yield a product which is contaminated by several per cent of impurities, and the electrolytic method of refining, which is so successful in the treatment of many metals, is less readily applicable to the purification of manganese.

Metals of low melting point such as mercury, cadmium, and zinc have been purified by distillation, but the method of distillation developed by Dr. Walters and his associates at Carnegie is significant because of the high melting point, 1,244 deg. C., of manganese.

The process used follows: Crude metallic manganese is placed in a pure magnesia crucible over which a similar crucible is inverted to condense the distilled metal. The crucibles are placed inside a silica tube 4 in. in diameter and 2 ft. long, which is closed at both ends and connected to a vacuum pump. The central part of the silica tube is surrounded by a water-cooled copper coil of about thirty turns, through which an alternating current of several amperes at a frequency of some twenty kilocycles is passed. This induces eddy currents in the manganese and heats it to the melting point. The pressure maintained in the silica tube by the vacuum pump is less than a twenty-thousandth of the atmospheric pressure. The molten manganese boils under the low pressure and sends off manganese vapor which is condensed in the upper crucible. The impurities remain in the manganese in the lower crucible, and the distilled metal, which has been formed by the condensation of manganese vapor, is of a high degree of purity.

Distilled manganese has a bright silvery luster which does not tarnish upon exposure to air. Unlike many pure metals which are comparatively soft and ductile, distilled manganese is extremely brittle, and hard enough to scratch glass.

Personal Notes

E. L. Estabrook has returned to New York from Venezuela.

H. G. S. Anderson, of Muskogee, Okla., has been in New York.

Durand A. Hall, of Berkeley, Calif., is examining mines at Butte, Mont.

J. A. Inslee, mining engineer and operator, of La Paz, Bolivia, is in New York.

Louis A. Wright, consulting engineer, has returned to his home at San Mateo, Calif.

C. J. Kingston, mining engineer, of San Diego, Chile, has been in New York and sailed on Oct. 27 for London.

R. H. Stewart and W. B. Farris, of Vancouver, B. C., have been elected to the board of directors of Grandview Mines.

Dr. E. U. von Buelow has resigned from the North American Exploration Company and will open an office in Denver.

E. W. Todd, consulting geologist, is examining the properties of Lebel Oro, in the Kirkland Lake district, northern Ontario.

J. P. Delaney, president of Whitedelf Mining, is on a trip of inspection to the properties in the Clark Fork district of Idaho.

Charles McCrea, Minister of Mines of Ontario, has gone to Bermuda for three months, at the order of his physicians.

C. W. Worthington has been appointed mine superintendent of the La Bellevue mine by the directors of East Sudbury Deep.

A. E. Adami, professor of metallurgy of the Montana School of Mines, at Butte, has been made vice-president of that institution.

F. C. Brown, of Boise, Idaho, passed through San Francisco recently en route to New Zealand, where he and his wife will visit old friends.

H. Robinson Plate, consulting engineer, has resumed engineering practice with offices in the Holbrook Building, San Francisco.

John A. Burgess is in New York, on his way to San Francisco, after spending the summer in the Sudbury district of Ontario, Canada.

Charles R. Blackburn has been engaged as consulting engineer and geologist for the Aspen property of Salmo-Malartic. It is near Nelson, B. C.

Charles A. Ordway, mining engineer of Milwaukee, Wis., was recently in San Francisco after examining a mining property near Clifton, Ariz.

Charles E. Prior has resigned his position with the Mexican Corporation to accept that of general manager at Wiluna Gold Mines, Wiluna, Western Australia.

Jean Verdussen, metallurgical engineer of Union Minière du Haut-Katanga, at Panda, Belgian Congo, is returning to Belgium in December for a short vacation.

G. A. Joslin has completed an examination of the Delamar mine, in Nevada, for Los Angeles interests, and has returned to Los Angeles.

William Whyte left Aranzayz, Mexico, in August, to join the staff of the Wiluna Gold Mining Company, operating in Western Australia.

Arvid E. Anderson, until recently chemist and metallurgist of Ohio Copper, has accepted a position as research metallurgist with the American Cyanamid Company.

Leslie Urquhart, of Russo-Asiatic Consolidated, recently inspected the Bulolo gold fields at Rabaul, New Guinea, where 83 leases have been acquired by a London group.

Charles H. Herty, industrial consultant, who specializes in the development of the natural resources of the Southern states, has opened an office at 101 Park Ave., New York City.

Lieutenant Colonel John V. Richards, mining engineer with the Bureau of Internal Revenue, Washington, D. C., has been elected president of the Reserve Officers' Association of the District of Columbia.

Harrison E. Clement, who recently resigned as general manager of the Paymaster mine in the Porcupine district, Ontario, may be reached at P. O. Box 186, General Post Office, Toronto, Ont.

Charles Howbert has resigned as manager of the Anchoria and Conundrum mines, recently acquired by J. F. Durocher Stone, and is now in New Mexico examining prospects for Colorado Springs interests.

Samuel W. Cohen, consulting engineer, of Montreal, has legally assumed the name of Samuel W. Livingston, but will carry on his professional practice as heretofore as Samuel W. Cohen, consulting mining engineer.

Gustaf E. Bjork has joined the mill and smelter design division of American Smelting & Refining with headquarters at El Paso, Tex. Mr. Bjork was formerly associated with the designing division of Bunker Hill & Sullivan at Kellogg, Idaho.

Frank N. Speller, director of the department of metallurgy and research of the National Tube Company, was elected chairman of the metallurgical advisory board to the Carnegie Institute of Technology and the U. S. Bureau of Mines recently.

A. L. Engel is visiting Butte, Mont., where he will remain for a few months before returning to Mexico. Mr. Engel is a graduate of the Montana State School of Mines and was formerly a member of the research department of Anaconda Copper in Montana.

C. L. Colburn, mining engineer, of Denver, has been elected secretary of the Colorado Mining Association to fill the vacancy caused by the death of M. B. Tomblin. Mr. Colburn is a graduate of the Colorado School of Mines, class of 1907, and was at one time general manager of Butte-Duluth.

J. E. Hammell, president of Northern Aërial Minerals Exploration, Ltd., has returned to Toronto after a survey of the field of the company's operations. He expressed himself as satisfied with the progress made by the company in prospecting unexplored territory for minerals with the aid of the airplane.

Harry Browning, secretary of the British Columbia Chamber of Mines since 1922, has resigned and has accepted the position of mining statistician for the brokerage firm of Lennard, Poisson & Waghorn, of Vancouver, H. N. Freeman, assistant secretary of the Chamber of Mines, has been appointed acting secretary.

OBITUARY

Mrs. E. W. Nash, widow of E. W. Nash, founder and first president of American Smelting & Refining, died on Nov. 3 at the age of 80.

Thomas R. Henahen, inspector of mining district No. 1, Colorado, and state commissioner of mines from 1911 to 1915, died on Oct. 22. He was 72 years old.

Victor E. Lemaitre, retired mining engineer, of Peru, died in New York on Oct. 30. He was a graduate of the engineering school of the University of Lima and practiced mining engineering in Peru and Bolivia until 1910. Mr. Lemaitre was 58 years old.

L. W. Hutton, of Spokane, died in that city on Nov. 3. Mr. Hutton was one of the pioneers in the development of the Coeur d'Alene district of Idaho. In 1896 he became interested, with the late August Paulsen, the Day brothers, and others, in the Hercules mine, from which profits amounting to $19,000,000 were made. Mr. Hutton was 68 years old.

Frederick C. Tricks, one of the last of the Australian pioneers, died recently in Melbourne at the age of 92. He arrived in Melbourne in 1854, three years after gold was first discovered in Australia. From that time on, he followed every new gold rush, with varying success. In the early 'sixties he went to Gippsland, Victoria, where he remained for many years. After he returned to Melbourne he still remained interested in mining concerns and was a member of the Melbourne Stock Exchange till he retired a few years ago.

COMMENT AND CRITICISM

The Engineer Must Make Good

Are Dam Disasters Evidence of Trimmed Safety Factors?

THE EDITOR:

Sir—I note in the issue of Oct. 6 the comment of Dr. Chester R. Longwell, of Yale University. In his quoted article in the issue of Aug. 25 he stresses that the most significant finding of the Young Commission was that "The failure of the St. Francis Dam was due to defective foundations." The Mead committee report states that "The dam failed as a result of defective foundations," but the facts and geology stated in this report do not correspond with the statements of Doctor Longwell and his descriptions concerning the deficiencies and solidity of the schist, because the conglomerate upon the hillside was the weaker rock. He comes to the conclusion that all the schist under the major portion of the dam "had many elements of weakness and none of strength."

Doctor Longwell classes among unworthy engineers those who doubt that a "properly designed" dam "can hang in thin air." What about the failure of the Bear River Dam, in Utah, which was easily repaired, and that of the Puentes Dam, in Spain, involving a loss of over 600 lives, which remained as an arch with a 200-ft. span? The water went under these dams because of defective foundation material.

It is pointed out in the Mead committee report that "The cementing material in the red conglomerate consists of clay, iron oxides and amorphous silica. The clay and silica soften in the presence of water while the iron oxides dissolve. . . . The percolation of the water into the conglomerate would soften the cementing material and would dissolve the gypsum which filled some of the fissures in the rock." This is far-fetched stuff. The dissolving of iron oxides so readily is new. They meant suspension. I can see now that it is necessary to call in the chemical engineer on these projects. The Mead committee took samples of the concrete of which the dam was constructed, of the schist and of the conglomerate, and had them tested. The concrete showed resistance against crushing of from 1,326 to 2,200 lb. per square inch. And the schist showed from 3,600 to 11,000 lb. per square inch, and no appreciable difference when wet. The conglomerate showed 600 to 1,960 lb. per square inch and, when wet ten minutes, from 210 to 845 lb. per square inch. Subsequent samples taken from the conglomerate area and soaked for 24 hours or so disintegrated. Nothing in the Mead committee report disclosed the findings of the geologists mentioned as having reported on the dam site, and the only conclusion one can draw is that that precaution had not been indulged in; nor is any of the testimony of the engineers disclosed.

The Mead committee report gives a brief statement of the geology and the position of the dam. It shows that it rested mostly on the schist; that on the east side the dip of the schist was parallel with the general slope of the hillside; that there were no steps or footings cut into the hill on either side, but that the ends of the dam lay on the slopes of the hills with very little roughening; that the dam set on the edges of the schist across the bottom and well up on the west side of the canyon; that above the schist on the west side the dam rested on the conglomerate; and that "the line of separation between the schist and the red conglomerate is very clear and distinct and forms what is geologically known as a dead fault." This is the first time I ever heard of a contact being termed a fault.

There is nothing to show any seepage under or weakness of the remaining low wall for 500 ft., resting on the soft conglomerate. The spillway is on the conglomerate area. It is stated in regard to the dam proper that, "The fractured faces of the block still left standing after the failure of the dam show by their discoloration that cracks had existed and had extended part way or entirely through the dam." The record shows that the dam was full to within 4 ft. of the crest for about two weeks, in May, 1927, so it is clear that the dam was on the point of failure at that time. There is no record of any leakage until about Feb. 29, 1928, when the water was above the level of May, 1927, and reached the crest level on March 5, this year. It appears from the questions propounded that the cracks had existed for some time and had been caulked with oakum, and had increased so as to require repeated caulking in an effort to check leakage. This shows that there had been movement of the west end of the dam for some time. Were any of those cracks in evidence in May, 1927? I have not seen, in any of the reports and comments, that anyone considered the dynamic forces generated in the structure as the reservoir filled to capacity. That seems to have been strictly avoided, so far as publicity is concerned.

The first and fifth items of the findings are as follows: "(1) The type and dimensions of the dam were amply sufficient if based upon suitable foundation. (5) This failure reflects in no way on the stability of a well-designed gravity dam properly founded on suitable bedrock." The conclusions do not point out what a suitable bedrock is, and that for a gravity dam of such a type a perfect union of the dam and bedrock by cementation is required; otherwise, if the merest separation starts, the uplift forces of the hydrostatic head begin to act and help to overthrow the dam. They do not point out that mica schist gives poor adhesion to the concrete if the mica is predominant. They do not point out that an arched gravity dam, as it lays during construction to completion, is inactive, but when it is loaded by a full reservoir it adjusts itself and transfers pressures horizontally to the abutments. In this case the arch pressures found no particular resistance against the sloping schist and softer conglomerate. The arch movement broke the union with the foundation, giving the full uplift effect. This, combined with the water pressure or weight against the dam, doubled up the forces and simply pushed the dam over, because of the low factor of stability.

The conglomerate end went first, as that end showed the greatest movement and weakness. The only approach to a disclosure of the wrecking forces is contained in the following: "The manner of failure apparently was that the first leak, however started, began under the concrete at that part of the dam which stood on the red conglomerate; this leak increased in volume as it scoured away the foundation material already greatly softened by infiltrated water from the reservoir which removed the support of the dam at this point, and since no arch action could occur by reason of yielding conglomerate abutment made failure of the dam inevitable." This does not correspond with preceding statements that seepage issuing from the wall was not discolored, and that, when inspected, there was nothing abnormal

or anything to cause any apprehension.

No engineer wants to see his work fail, but this disaster is proof that he has for a long time been trimming down the factors of safety too close in the interest of economy, and not taking a sufficiently serious view of the dangers to life and property from some unforeseen condition or oversight. The St. Francis dam site is perfectly good for a structure that is free from uplift or sliding tendency. It is firmer than the concrete you can place upon it, and the conglomerate will carry any load you can place upon it in such a structure.

There has been a tendency lately to design and make grand experiments of the unusual at public expense. As an example we have the monstrosity known as the Coolidge Dam and the shaft and tunnel spillways of the Gibson Dam, Mont., and the Owyhee Dam, Ore. The Coolidge Dam is styled a multiple-dome dam. It is in normal repose when the reservoir is full, but when empty it is full of wrecking strains, and had to have a lot of steel reinforcing to maintain its integrity and overcome such wrecking strains. In the spillways of the dams mentioned there is a tremendous waste of money over and above what the customary method would cost, besides the many unknown factors and results which will attend these unusual provisions when they are called upon to handle some unusual flood that these projects are subject to from time to time. Many arguments can be brought against them in their poorly thought-out proportions, and really none in favor of them, as against a natural overflow.

A Coolidge Dam description states that it has a 50 per cent uplift and an overturning factor of 2.00 when the reservoir is full, and then goes on to say, "In the design, as a precaution against uplift, the foundation will be grouted; the dam will be anchored to its base and provided with inspection and drainage galleries. The stability factors conform closely to the usual custom and could be increased if considered desirable by giving the dam a flatter slope, but it is believed at a sacrifice of economy."

What if this foundation should prove deficient in adhesiveness?

The engineers figure on a factor of safety of 5 against crushing in the concrete of the domes and buttresses. Taking the developed strength of the concrete in the St. Francis Dam, as shown by the tests, it looks as if this factor would diminish to between 3 and 4. There is no evidence that the geologist figured in this project at all.

I have no desire to pose as a paragon, but I still contend that experience is a priceless aid to success. Quoting from a few well-known authorities: Frizell says, "A structure which fails is often more instructive from an engineering point of view than the one which stands." As to an arch dam: "Its necessarily close connection with the stream bed does not permit the lower part to act as an arch without breaking its connection with the bed, which would be attended with inconvenience and danger." He also recommends that arch dams not exceed 500 ft. in length. Patton says that, "Experience had proved their construction to be safe, but with what margin or factor of safety is not known." When he stated that, years ago, it was before any very long dams had been built. Why the experimental Stevenson Dam was built is obvious.

A gravity dam, to entitle it to that distinction, must be of such generous dimensions and weight as to be proof against sliding on its base, uplifting, and overturning. Its weight is the most important factor in assuring stability. A framed dam, on the contrary, does not depend upon its weight for stability. It can be built of wood, steel, or reinforced concrete, in accordance with size and permanency desired, on almost any foundation, but must be designed as a framed structure.

A dam is a retaining wall. The almost universal rule is to build retaining walls with a slight batter on the face and a sloping or stepped back. Water, being more mobile than other material, has no contact friction or self-supporting tendencies to assist in stabilizing; hence a longer and flatter slope is required for water, to throw the resultants well within the base.

A dam designed along the foregoing lines, proof against sliding, uplift, and overthrow, can act as a weir, and the more you load it the more firmly it holds. It can be a real gravity dam or a framed structure; and, in view of experience to date, I think it a criminal matter for any engineer to design any other kind of a dam, except in narrow rocky canyons. Dams these days are not for temporary purposes and should be built in the most permanent way and with every factor of safety that it is possible to take advantage of. Cost should be secondary, as money cannot heal a disaster. Better tax a little more than to have to tax much more later to rebuild and pay damages. It is to be noted that the Reclamation Bureau, in view of the St. Francis Dam disaster, is advertising the safety measures it is taking in construction of irrigation dams.

It seems to me that there is an opportunity for many to make good in conformity with the outline of what an engineer is, as given by John Hays Hammond in your issue of Sept. 22, in part as follows: "He has been taught to seek the truth, irrespective of consequences, and to have the courage of his convictions. His reputation depends upon the realization of his predictions. Sophistry has no place in engineering. Engineers are not privileged to urge extenuating circumstances to explain their failures, but are held strictly responsible. The lawyer may ascribe the loss of his case to an incompetent judge or corrupt jury. The doctor the loss of his patient to the will of God. The engineer cannot escape the odium of failure. He must make good." W. H. HAMPTON.

Portland, Ore.

An Appeal From Canada

THE EDITOR:

Sir—I have been engaged to invent a machine for prospecting mines, especially gold mines, by electricity and magnetism, by taking advantage of the susceptibility of the metal.

I have not yet completed to work it out, and I am now in need of some help from one who has already started in this line of work.

If you know any person or persons who have invented such machine, or any school or schools which teach this subject, will you please let me know? Any information and book name concerning this matter will be very much appreciated by me.

If I can make the new invention by your help, you shall have some rewards in future. K. MAEKAWA,

President, Organization for Scientific Prospecting of Mines.

Ocean Falls, B. C., Canada.

[In thus virtually asking for the assistance of his competitors Mr. Maekawa evidently assumes that the consulting geophysicist is as high-minded as he is deep-thinking. We hope this is the case; altruism is a beautiful trait. But the test proposed is rather severe. Just suppose that Mr. Maekawa should really go and invent a gold finder, after getting this help, where would the geophysicist be then, poor thing? Undoubtedly he would be at a serious disadvantage, if not completely sunk, along with his magnetometers, galvanometers, and what not. No! A geophysicist must use discretion, equal to that of the fairest maiden, even if it means suppressing his finer impulses. We are afraid that Mr. Maekawa will have difficulty in getting the help he needs, unless perchance he is willing to retain some member of the geophysical brotherhood, possibly offering him a half interest, in which case someone might respond to his S.O.S. In the meantime, he might read some of the excellent bulletins on the subject put out by the Soviet government; also Osborne's Calculus. — THE EDITOR.]

World Shaft-Sinking Record Still Held by United States

THE EDITOR:

Sir—I call your attention to the news item on Sub Nigel appearing in your issue of Oct. 13. The world's shaft-sinking record is still held by my company, being 427½ ft. in 31 days. This record was made in 1921 at the Water Lily shaft in Tintic district, and it was at that time awarded *Engineering and*

Mining Journal's gold medal as official recognition of this record.

WALTER FITCH, JR.

Coronado, Calif.

[The mistake made by our Johannesburg correspondent was corrected in *E.&M.J.* of Oct. 20, on page 635.—EDITOR.]

A Dowsing Champion Challenges

THE EDITOR:

Sir—Just a few words in regard to the geophysical exhibition. It was a very interesting and attractive display of instruments, though I fail to distinguish their superior reliability as mineral locators in comparison with the divining rod. If we can use the phrase "mechanical psychology," then it can be applied to all of them, as it must be assumed that what they locate is what is already known to be there. They are, of course, reliable in proving the presence of an orebody, but all of that can be done with the rod alone by one who thoroughly understands the use and action of it (which I admit very few do), as many minerals can be located with it but not determined. One of the instruments had what they call a finder, or pointer, which I understand is used to get an attraction at a distance. This also can be done with the rod, either ahead, above, below, or behind, and if our early settlers who went into the wilderness to live had known the use of this instrument no enemies could have surprised them without their presence and direction of approach being discovered.

As I understand it, those instruments positively cannot determine anything and are good only for sulphides; therefore it is useless for me to challenge them, as they, in all of their beauty and expensive fittings, are not the equal of a one-dollar divining rod correctly used and understood. This can be proved by comparison anywhere, any time.

I tried to induce one of the demonstrators to make a test on public property, but nothing less than $200 would be of any attraction for him to go out and show his ability, though he has quite an exalted opinion of himself and instrument. One of the others was quite an agreeable fellow, but had sold his instrument, and of course could not take it out. One other evidently considered himself beyond comparison. I believe one of those instruments could be made 100 per cent perfect for everything.

This letter to you probably seems boastful and sceptical, but you have my challenge, and if you know of any instrument that will detect nickel I will show you a nickel district here that for productive value will equal any other known deposit of this mineral. It is very deplorable and unfortunate for New England that such an apparent animosity should be shown toward an instrument because of its simplicity without any knowledge of its merits.

Under all New England and probably the whole continent there are small rock rivers evidently flowing north to south. Why isn't it fair to assume that these thousands of streams issue forth into the Gulf of Mexico and are the cause of the Gulf Stream? If this is not the solution, then where do they go; what becomes of them? I have proof of these streams, and also the fact that salt water underflows all land. Would it be possible for this water to become magnetized in its course underground and take a northerly direction in the open?

This earth of ours is filled with energy, and I believe our Aurora Borealis to be caused by powerful magnetic emanations from the earth, probably influenced by other heavenly bodies.

J. H. ROBINSON.

Cambridge, Mass.

Tin Possibilities in Mexico

THE EDITOR:

Sir—There has been some inquiry as to the possibilities of tin mining in Mexico. At present, in the district within 200 miles of Aguascalientes and within 200 miles of San Luis Potosi, there is nothing doing, though one occasionally runs across the *gambucino*, and there is the gentleman miner who occasionally visits his "mine" in company with a possible cash buyer. Many companies and individuals have tried to develop these tin deposits and failed, though it seems to me that most of them did not spend enough money on dynamite, or spent it unwisely, or were unfamiliar with the characteristics of tin deposits. Cassiterite of good quality occurs from Durango to Queretaro, and between Queretaro to a point north of San Luis Potosi, but most of these tin veins peter out at a depth of 30 to 50 ft. from the surface. An occasional tin vein, however, is of sufficient strength and persistence, in crushed fracture zones, with kaolin, so that it can be traced on the surface for a long distance.

I believe the day will come when real prospectors will find some meritorious tin prospects in Mexico. Among the thousands of occurrences, some should be worth developing. Take the "Los Amigos" as an example. This vein occurs in a pronounced vertical rock fracture more than 60 ft. wide. The fracture can be traced for a distance of about 2,800 ft., in which there are more than 40 excavations a few feet deep, showing tin. One hole is 100 ft. deep, 20 ft. wide, and 60 ft. long. The vein varies in width. At one point, 125 ft. below the surface, it is 9 ft. wide, containing disseminated cassiterite, white, red, black, yellow, in grains and as a powder, in pockets and seams, lining the wall, and in the rock itself. Some of my friends are trying to develop this prospect now. J. CAMET.

Villa Reyes, S. L. P., Mexico.

Canadian Companies and Publicity

THE EDITOR:

Sir—The Sept. 29 issue of *Engineering and Mining Journal* contains a very interesting article on British Columbia by T. A. Rickard; but I do not think he has been fair in his denunciation of the companies in mass for secrecy of their work. My personal experience with Canadian companies has been very fortunate—much more so than with some of our leading American companies. I have never failed to secure the information I have asked for, usually promptly, but always willingly.

The figures he gives for Britannia are somewhat confusing. In the balance sheet of the Howe Sound Company are given the amounts quoted in the articles, but they state that these figures include their interest in subsidiary companies. As one of their principal sources of income is from the Mexican subsidiaries, it would be interesting if the parent company would give out this information. From the report it is impossible to ascertain how much the different units are making; in fact, whether or not some of them are working at a loss.

It would also be of interest to know, after subtracting the income from the non-copper subsidiaries from the totals of the Howe Sound Company, if the remainder would still show Britannia to be the biggest copper producer in the British Empire. FRED MACCOY.

Mexico, D. F.

Solving the White-Metal Mystery

THE EDITOR:

Sir—On page 503 of the Sept. 29 issue I read a letter from George Schumacher, of Medford, Ore., regarding the "tin" and "white metal" resulting from the calcium carbide treatment of the mystery ore from Oregon. I have twice investigated this metal, and my results have been identical with those of Mr. Schumacher. What a time killer this tin mystery has been for many New York metal dealers! W. H. STAVER.

Jackson Heights, N. Y.

Bad News for the Diamond Industry

THE EDITOR:

Sir—I just discovered here very large diamond mines. The diamonds are snow white for jewelery and diamond shivers for cheap rings and very hard bort and carbonados for industrial use. Here is a go for the Americans! Please publish my great discoveries.

Some Kohinoors are coming out of my mines, the largest 2,625 carats, the world's wonders. H. BENGTSSON,
Prospector.

Rubyvale, Central Queensland, Australia.

By the Way

Contacting State Mining Bureaus and the Profession

AS ALL state organizations such as mining bureaus and divisions of mines and mining are supported by taxes, it is essential that mining engineers and others in the mining industry should familiarize themselves with the activities of their respective state organizations, to the end that direct benefit may accrue, that expenditures be restricted to worthwhile effort as well as to the machinery of administration, and that the professional work of mining engineers and other technicians be not encroached upon.

Progress is being made in California toward creating contacts between the State Division of Mines and Mining, formerly known as the California State Mining Bureau, and the profession. This has been accomplished by the mineral committee of the California Development Association, of which Mr. Charles W. Merrill is chairman. The committee has undertaken consideration of the budget of the State Division of Mines and Mining. Two of the members of the committee will assist the state mineralogist in revising the program of activities of the organization and the work of the state department. Suggestions were also made. One had to do with publication of additional copies of the 1916 geological map of California; another with the completion of the geological survey of California; a third condemned unnecessary duplication of work in the compilation and publication of statistical data.

This intimate contact between the mining industry and state mining organization is badly needed. If the state officials do not come to the mining industry, the mining profession should take the initiative. Mutual benefit out of such contacts will accrue, and efficiency will be promoted.

Ore in Sight

THE council of the Institution of Mining and Metallurgy, recognizing the great importance, to the mining industry and to the public generally, of the subject dealt with in the paper on "Ore in Sight," by J. D. Kendall (*Transactions*, Volume X), appointed a committee to consider what steps the Institution might usefully take in defining the term "ore in sight." Views expressed by leading members of the profession showed a great divergence of opinion as to the definition of the term.

After due consideration and discussion the council came to the following decision: (1) That members of the Institution should not make use of the term "ore in sight" in their reports without indicating, in the most explicit manner, the data upon which the estimate is based; and that it is most desirable that estimates should be illustrated by drawings. (2) That, as the term "ore in sight" is frequently used to indicate two separate factors in an estimate—namely (*a*) ore blocked out (that is, ore exposed on at least three sides within reasonable distance of each other, and (*b*) ore which may be reasonably assumed to exist though not actually "blocked out")—these two factors should in all cases be kept distinct, as (*a*) is governed by fixed rules and (*b*) is dependent upon individual judgment and local experience. (3) That in making use of the term "ore in sight" an engineer should demonstrate that the ore so denominated is capable of being profitably extracted under the working conditions obtaining in the district. (4) That the members of the Institution be urged to protect the best interests of the profession by using their influence in every way possible to prevent and discourage the use of the term "ore in sight" except as defined above; and the council therefore strongly advise that no ambiguity or mystery in this connection should be tolerated, as the members of the council consider that such ambiguity is an indication of dishonesty or incompetence.

When Estimates Vary Widely

HOW many grains are there in the test tube? That was the question asked visitors to the exhibit of the Intermountain Station of the U. S. Bureau of Mines at the Utah State Fair held recently at Salt Lake City. In all, 483 persons submitted their estimates, after viewing the ½ in. test tube filled to a depth of 1¾ in. The tube contained 32,886,500 grains, and the closest estimate was 33,000,246, the second closest being 30,000,000. An analysis of the estimates submitted follows:

Estimated Number of Grains	Number of Estimates
1 to 1,000	9
1,000 to 10,000	42
10,000 to 100,000	85
100,000 to 1,000,000	100
1,000,000 to 10,000,000	140
10,000,000 to 100,000,000	54
100,000,000 to 1,000,000,000	21
1,000,000,000 to 10,000,000,000	13
10,000,000,000 to 100,000,000,000	6
100,000,000,000 to 1,000,000,000,000	5
More than 1,000,000,000,000	8
Total	483

In fairness to the estimators it should be added that grains of five different minerals and of four different sizes were contained in the test tube. An analysis of the contents of the tube follows:

Mineral	Mesh	(*a*) Number of Grains
Malachite	Minus 48 plus 65	96,000
Calcite	Minus 48 plus 65	199,000
Hematite	Minus 100 plus 150	286,000
Galena	Minus 150 plus 200	525,500
Pyrite	Minus 325 plus 640 (*b*)	31,780,000
Total		32,886,500

(*a*) The number of grains of each mineral was determined mathematically, after a factor based on the density, average diameter, and shape of the grains had been ascertained for each mineral. (*b*) This material was not screened, but very closely classified.

The exhibit was arranged by Prof. A. M. Gaudin, of the department of mining and metallurgical research of the University of Utah.

Tragedy and Comedy Ended Alchemists' Gold Search

TRAGEDY in England, and comedy in Germany, ended the researches of alchemists for the means of turning baser metals into gold and silver. In England James Price claimed to have found a way of causing the conversion. He even demonstrated his experiment before a large group of celebrities, including King George III. When requested by the Royal Academy, however, to exhibit his method to them he showed a disinclination to do so. Finally, however, he was persuaded. When only three members of the academy arrived on the day appointed, Price swallowed a quantity of the strongest poison known at that time, and died, says the *Detroit News*.

A contemporary theologian named Semler, in Germany, placed a so-called panacea, the salt of life, in a jar with a stone. He later found flakes of gold on the stone. He entered into a series of debates with famous chemists of the day, but failed to convince them that he had analyzed the substance and found it to be gold. They analyzed some and found it to be a metal called "Dutch metal." Upon investigation it was found that a servant of Semler's placed the gold each day on the stone to please his master. In the servant's absence the wife purchased the cheaper Dutch metal and spent the remainder for brandy. Semler admitted his mistake, and the matter was a standing joke for many years.

A Bouquet of Doubtful Fragrance

ONE of our namesakes, published in Phoenix, Ariz., in reprinting the announcement made by Anaconda Copper in regard to increasing miners' wages, put the following statement in quotation marks: "The above increase shall remain effective so long as the average domestic price of electrolytic copper shall average 15c. a pound or more." The copy of the announcement that we received from Butte said: "the domestic price of electrolytic copper, as quoted by *Engineering and Mining Journal*, shall average 15c. a pound or more." The editor of the Arizona publication may have thought that, by using the blue pencil in quoting an official announcement, he could pay a subtle compliment to *E.&M.J.* for the universal acceptance given to its metal quotations. The source should be taken for granted, he perhaps argued. If so we accept the news item in the spirit in which it was concocted.

INDUSTRIAL PROGRESS

Reducing the Personal-Element Factor

Survey of Mining and Metallurgical Field Shows Wide Variety of Indicating and Recording Instruments in Use

CONCLUDING INSTALLMENT*

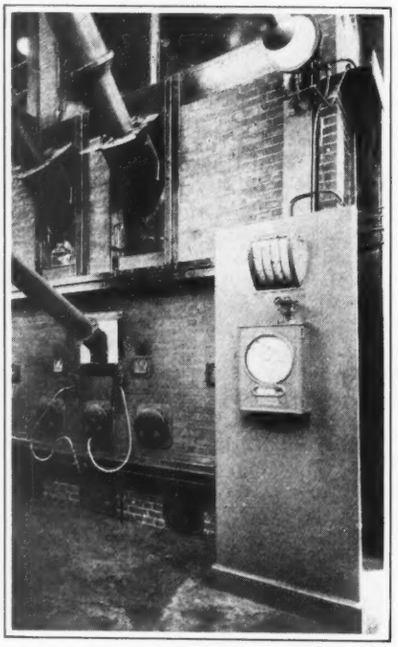
TO DETERMINE the extent to which automatic recording and controlling instruments are actually in use, a survey of the leading smelters of the United States was recently undertaken. The replies to the brief questionnaire submitted were most convincing. As to the advantages to be obtained through their employment, opinion is unanimous. Instruments are absolutely essential to smooth and efficient operation, it is agreed. They make possible a degree of accuracy obtainable in no other way. Without them, some even go so far as to say, it would be impossible to operate intelligently. The recording type of instrument, moreover, provides a continuous and permanent record of plant operation, and so constitutes a medium by which improvements may be made—a record not otherwise obtainable. At the same time, it furnishes a means of checking the work of employees and in some installations the running of individual machines. The survey, it may be added, included the power-plant operations conducted in connection with the metallurgical work.

Applications of Instruments in Practice

Instruments for indicating, recording, and in some installations controlling temperature were found to have many applications at the plants considered. They include thermometers and pyrometers. The specific places in which these are used and the purposes served are as follows:

One large copper smelter, in Arizona, is using recording thermometers of both liquid and gas-filled bulb types. Of these it has fifteen, giving temperatures of the boiler feed water, the condenser cooling water, and of various sections of the steam lines, in the power plant, and of the jacket water at the blast furnaces. Besides these it has eleven recording pyrometers, one being of the potentiometer type and the remainder of deflection types. Of the latter, one has a single record strip chart, two have duplex record strip charts, one has a six record multiple recorder strip chart, and six are of the single-record circular-chart types. These are used to record the temperatures of the waste-heat gases in the inlet and outlet flues of the boilers; also of the gases in the roaster plant flues, in the passages of the Cottrell plant, and at the base of the stack. The potentiometer-type instrument, first mentioned, records and controls the temperatures of a ten-ton annealing oven.

A Western lead smelter has seven recording thermometers, one each on the charge floor, in the baghouse, the Cottrell plant and moisture room, and three at the thaw houses. A second lead plant, similarly situated, is using eight recording thermometers, two each at the thaw shed, Cottrell plant, and baghouses, and one at the blast furnaces and one in the power plant. In contrast with these, another lead smelter, also in the West, states that it uses temperature-recording instruments (fifteen in all) on its furnaces, kettle settings, retorts, boilers and the like. "In fact," the superintendent adds, "it is rapidly becoming universal with us to use them in any of our operations along this line that are of any importance at all." A Montana plant has seven recording thermometers. Two of these determine the gas temperature in the Dwight & Lloyd roaster flue, one each serves to record the temperatures of the gases in the roaster stack and the baghouse flue, and one is placed in the thaw house. The remaining two are in the sampling mill in the sample drying cabinets.



Meter aids in getting best results from boiler. It records rates of flow of steam and air; also temperature of gases leaving boiler.

Use of twelve instruments for recording temperatures is claimed by a plant in the Pacific Northwest. One, a gas thermometer, is used on the boiler feed water in the smelter power house; seven are mercury thermometers, one is used to record the temperature of the lead conditioner in the zinc concentrator and the other six are in the Cottrell plant. Of the remaining four, two are pyrometers, which are used for regulating the flue temperatures of the zinc-casting furnace; one is a thermometer for measuring the front-chamber temperature in the acid plant, and one an electrical pyrometer for controlling the kiln temperature in the arsenic granulator.

In Table I are listed the instruments in use at the plant of a large copper mining and smelting company in the inter-mountain district of the West. Included are not only the temperature indicating and recording instruments in use, but also the recording instruments employed for other purposes. It will be noted that in all 56 instruments are used.

A Southwestern smelter has five recording thermometers in its power plant, three on exit gases and two on the feed water. Besides these it has six thermometers in the smelter proper, one each on the converter flue, reverberatory flue, sample dryer, baghouse inlet and outlet, and one on the baghouse stack. It also has a pyrometer on the main stack.

In the South a copper company, which operates an acid plant as an adjunct to its smelter, uses a large number of instruments of various kinds. These include three recording thermometers and three recording pyrometers in its acid plant, and in its smelter three recording pyrometers, two on the roaster gases and one for general purposes. This equipment is set forth in Table II on page 758.

At an Eastern refinery, 39 instruments in all are used, of which 16 are for the purpose of recording temperature. This equipment is listed in Table III.

In Colorado, at a plant using a process that may be termed unique, a high-resistance direct-reading pyrometer is

*Part I appeared in last week's issue.

used for determining the bed and gas temperatures of the various hearths of the roaster; also a recording thermometer, 0 to 500 deg. C. range, to determine the temperature of the roaster column cooling air; two recording thermometers, 0 to 100 deg. C. range, to record leaching solution temperatures; four recording thermometers in its drier, and one recording thermometer in its Cottrell precipitation plant to record the inlet temperature.

pyrometers in sharpening steel. It finds that thus it gets a more uniform grade of steel. Another company, which has been using three pyrometers for the purpose for about three years, says that it would not attempt to sharpen drill steel without an instrument for indicating temperature. Still another company controls the temperature in its forge furnace with the aid of an instrument which regulates the oil flame to the burners. The remaining company uses

in the turbine condenser and of the draft in waster, plant flues, and stack. Besides these there are twelve recording pressure gages giving records as to high- and low-pressure air and steam lines. Two V-notch flow meters are also employed, one on the boiler feed water and one on the turbine condensate. On the steam lines four flow meters of the orifice type are used.

One of the lead smelters referred to uses two instruments for recording flow,

Table I—Recording and Indicating Instruments in Use at Plant of a Large Copper Mining and Smelting Company

Kind of Instrument	Range	Purpose	Location	Number Used
Temperature recorder	0 to 220 deg. F.	Records temperature of thrust bearing of 12,500-kw. turbine	On 12,500-kw. turbine	1
Temperature recorder	0 to 220 deg. F.	Records temperature of generator end of 12,500-kw. turbine	On 12,500-kw. turbine	1
Temperature recorder	0 to 220 deg. F.	Records temperature of middle bearing of 12,500-kw. turbine	On 12,500-kw. turbine	1
Temperature recorder	0 to 220 deg. F.	Records temperature of turbine end of 12,500-kw. turbine	On 12,500-kw. turbine	1
Temperature recorder	0 to 150 deg. F.	Records temperature of air in 12,500-kw. turbine	(Generally) on 12,500-kw. turbine	1
Temperature recorder	0 to 100 deg. F.	Records temperature of inlet water of condenser on 12,500-kw. turbine	On condenser of 12,500-kw. turbine	1
Temperature recorder	0 to 220 deg. F.	Records temperature of inlet and outlet water of 12,500-kw. turbine	Boiler room	1
Temperature recorder	0 to 220 deg. F.	Records temperature of feed water for boilers	On feed-water heater in boiler room	1
Temperature recorder	0 to 130 deg. F.	Records temperature of engine-room floor	In engine room	1
Temperature recorder	0 to 600 deg. F.	Records temperature of superheater stack gases	In boiler room	1
Temperature recorder	0 to 800 deg. F.	Records temperature of superheater steam	In boiler room	1
Temperature recorder	0 to 1,000 deg. F.	Records temperature of exit gases of No. 3 boiler	In boiler room	1
Pressure recorder	0 to 370 lb. per sq.in.	Records pressure in steam in main steam line	In engine room	1
Pressure recorder	0 to 250 lb. per sq.in.	Records pressure of steam entering 12,500-kw. turbine	On steam line to turbine	1
Pressure recorder	0 to 250 lb. per sq.in.	Records pressure of steam in main header	On 12,500-kw. turbine	1
Pressure recorder	0 to 30 lb. per sq.in.	Records pressure of low-pressure air to converters	In engine room	1
Pressure recorder	0 to 150 lb. per sq.in.	Records pressure on No. 1 compressor	In engine room	1
Pressure recorder	0 to 370 lb. per sq.in.	Records pressure on No. 2 compressor	In engine room	1
Vacuum recorder	0 to 30 in. mercury	Records vacuum on No. 1 compressor	In engine room	1
Vacuum recorder	0 to 30 in. mercury	Records vacuum on No. 5 air pump	In engine room	1
Draft recorder	T10 to T100 (100 = 1 in. H_2O)	Records draft in No. 3 boiler	In boiler room	1
Draft recorder	T10 to T100 (100 = 1 in. H_2O)	Records draft in No. 1 and No. 2 waste-heat boilers (coal-fired)	In waste heat plant	1
Air flow	0 to 180,000 cu.ft. free air per hour	Records flow of air to No. 2 converter	Converter operating floor	1
Air flow	0 to 180,000 cu.ft. free air per hour	Records flow of air to No. 3 converter	Converter operating floor	1
Steam flow recorder	0 to 120,000 lb. per hour	Records flow of steam from waste-heat plant	Power plant office	1
Steam flow recorder	0 to 160,000 lb. per hour	Records flow of steam from waste-heat plant	Power plant office	1
Steam flow recorder	0 to 4,000 lb. per hour	Records flow of steam delivered to shops	In engine room	1
Steam flow recorder	0 to 60,000 lb. per hour	Records flow of steam furnished by boilers Nos. 4 and 5	In power plant office	1
Steam flow recorder	0 to 100,000 lb. per hour	Records flow of steam furnished by boilers No. 1 and No. 2	In power plant office	1
Steam flow recorder	0 to 60,000 lb. per hour	Records flow of steam furnished by boiler No. 3	In power plant office	1
Steam flow recorder	0 to 90,000 lb. per hour	Records flow of steam furnished by waste-heat boilers No. 1 and No. 2	In power plant office	1
Steam flow recorder	0 to 15,000 lb. per hour	Records flow of steam furnished to smelter	Power plant office	1
Steam flow recorder	0 to 15,000 lb. per hour	Records flow of steam furnished to shops	Power plant office	1
Water flow recorder	0 to 250,000 lb. per hour	Records flow of feed water to all boilers	Boiler room	1
Carbon dioxide recorder	0 to 20 per cent	Records percentage of CO_2 in exit gases of No. 1 and No. 2 waste heat boilers	Waste heat plant	1
Carbon dioxide recorder	0 to 20 per cent	Records percentage of CO_2 in exit gases of No. 3 boiler	Boiler room	1
Ampere recorder	0 to 300 amp.	Records quantity of current used to operate No. 1 Aero pulverizer	Boiler room	1
Recording barometer	0 to 30 in. mercury	Records barometer reading and vacuum on 12,500 kw. turbine	12,500 kw. turbine	1
Temperature recorder	50 to 250 deg. F.	Records temperature in coal driers of coal pulverizing plant	Coal plant	2
Temperature recorder	40 to 1,000 deg. F.	Records temperature of exit gases of waste-heat boilers Nos. 1, 4, 5, 6 and 7	Waste heat plant	5
Temperature recorder	50 to 500 deg. F.	Records temperature of roaster stack gases		1
Temperature recorder	40 to 1,000 deg. F.	Records temperature of reverberatory stack gases		1
Temperature recorder	50 to 250 deg. F.	Records temperature of reverberatory emergency fuel oil in storage tank	Fuel oil storage tank	1
Pressure recorder	0 to 150 lb. per sq.in.	Records pressure of air used for delivering pulverized coal to reverbs	Coal plant office	1
Pressure recorder	0 to 32 lb. per sq.in.	Records pressure of air used by converters No. 2 and No. 3	Converter operating floor	2
Vacuum recorder	0 to 1 in. head of water	Records draft of uptake gases of reverbs No. 2 and No. 3	Reverb tapping floor	2
Vacuum recorder	0 to 2 in. head of water	Records draft of gases in reverberatory stack	Reverb stack	1
Vacuum recorder	0 to 1 in. head of water	Records draft of gases in roaster stack	Roaster stack	1
Pressure recorder	0 to 50 oz. per sq.in.	Records pressure of air to flotation cells	Mill foreman's office	1
Pressure recorder	0 to 120 lb. per sq.in.	Records pressure of air to airlifts, filters, orebins, miscellaneous	Mill foreman's office	1

A lead-zinc mining company which converts a large part of its output into paint products states that practically 75 per cent of its operations are controlled by pyrometer readings, most of them in making zinc oxide. For the latter purpose this operator makes use of pyrometers equipped with high-temperature thermocouples.

A use for temperature recording and controlling instruments that has not been sufficiently developed is in the shop where cutting tools are tempered and where the heat-treatment of steel, especially of drill steel, is part of the routine work. Apparently, the bulk of drill steel is sharpened and tempered with no aid for determining the proper temperature save that afforded by the eye. Of a dozen companies approached only four claimed to be using instrumental aid. One of them—among the largest on the continent—is using three an optical pyrometer periodically to check the men engaged in tempering.

Pressure and Flow Instruments

In the foregoing, attention has been directed to the extent of the use of temperature-recording and indicating instruments. Besides these, of course, the plants referred to employ instruments of other types and for other purposes, in varying degree. Tables I, II, and III set forth the instruments of these latter types that are used in the three plants respectively covered. For the most part they comprise instruments for indicating and recording pressure or flow of steam, air, and water.

At one of the plants other than those covered in the table—namely, the copper smelter in Arizona—six recording gages are in use. Four are of the diaphragm type and two are of the liquid sealed-bell type, giving records of the vacuum

one on the water system and another on the air to the furnaces; also nine for recording pressure in the power house, at the blast furnaces and in the baghouses. A second plant has in its power house a blast pressure chart and one for recording steam pressure; also a pressure chart at the baghouse and one at the Cottrell plant. The third of the lead plants measures all steam sent to the plant. The Montana plant uses five pressure recorders: one recorder in the power house on the blast air, one in the baghouse flue, two instruments in the roaster department for recording the air pressure on the fuel-oil burners, and one recorder in the boiler room on the steam. Besides these it uses a flow meter to record the volume of air supplied one of the furnaces, and a CO_2 recorder in the boiler room.

Ten pressure-recording instruments are in use at the plant referred to in the

Pacific Northwest. These include one 90-lb., one 15-lb. and two 900-lb. instruments recording air pressure in the smelter power house; also a 3-lb. instrument for recording the pressure of the air to the pneumatic flotation cells. Four other instruments in the power house record the boiler feed-water pressure; also that of the steam, and the vacuum on the condensers. Still another is used on the presses in the zinc-leaching plant. In another department the wash water used on the drum filters is measured. Besides these, four meters for measuring steam and eight for measuring air sent to different departments are being installed. In addition to these, ten draft regulators are used in the roasting and reverberatory departments, as well as various other draft-recording instruments on the flue systems.

The Southwestern smelter referred to has eighteen instruments for recording pressure and flow, the applications being similar to those already described. The Colorado plant uses ordinary pressure gages on its water lines, finding them helpful where the water is sprayed for humidifying flue gases before treatment in the Cottrell plant.

Of those previously referred to, the remaining company states that its entire water supply is metered and that pressure gages are used on the water system; likewise, that all pressure gages are provided for all air and steam lines in every operating department.

Table II.—Indicating and Recording Instruments in Use at a Southern Copper Smelter and Acid Plant

Temperature Recorders

Acid Department
- 2 recording thermometers, 50 to 250 deg. F.
- 1 recording thermometer, 50 to 150 deg. F.
- Used for temperature observations in lead acid chambers
- 3 recording pyrometers, two record multiple recorders, 0 to 2,000 deg. F.
- Used for recording temperatures of ammonia oxidation converters.

Smelter Department
- 2 recording pyrometers—thermocouple—0 to 1,800 deg. F.
- For roaster gas temperature
- 1 recording pyrometer—thermocouple—0 to 1,800 deg. F.
- For general use.

Power Department
- 1 recording pyrometer, 0 to 3,000 deg. F.
- Used to determine temperature in flue from boilers.
- 1 recording thermometer, 0 to 220 deg. F.
- Records temperature of boiler feed water.

Air Pressure or Flow Recorders

Mining Department
- 3 electric flow meters recording air delivered to different mines.

Acid Department
- 1 recording pressure gage, 50-oz. blast pressure.

Smelter Department
- 1 recording pressure gage, 0 to 50-oz. blast pressure.
- 1 recording vacuum gage, 0 to 50-in. water suction in use at sinter plant.

Power Department
- 1 recording pressure gage, 0 to 60-oz. pressure for furnace blast.
- 1 recording gage, 0 to 30-lb. pressure for converter blast.
- 1 recording pressure gage, 0 to 160-lb. pressure for high-pressure air.
- 1 double range electric flow meter for checking air supplies to various departments.

Flotation Department
- 1 recording pressure gage for air pressure.

Steam Pressure Recorders

Power Department
- 1 recording pressure gage, 0 to 200 lb., for steam pressure.

Water Pressure or Flow Recorders

Acid Department
- 2 electric flow meters for measuring water used in making sulphuric acid.

Power Department
- 1 recording pressure gage, 0 to 200 lb., for spray-water pressure.
- 1 recording pressure gage, 0 to 200 lb., for fire-water pressure.

Recording Ammeters

Acid Department
- 11 recording ammeters, 0 to 100 amp., for operating acid pumps.

Power Department
- 2 demand meters for electric power.
- 1 electromechanical line testing set with recording strip chart ammeter for finding peak loads.

Flotation Department
- 4 recording ampere meters for rod mills and flotation machines.

Miscellaneous Recorders

Acid Department
- 1 SO_2 recorder, thermal conductivity method.

Power Department
- 1 automatic CO_2 draft recorder, for boiler operation.

Flotation Plant
- 3 pulp dilution meters using low-pressure recording meters, 0 to 20 oz.

Table III.—Indicating and Recording Instruments in Use at an Eastern Refinery

Boiler and Power House
- 2 fluid meters on 10-lb. exhaust line from engines to tank room
- 1 fluid meter on air compressor. Steam
- 1 fluid meter on air compressor. Steam
- 3 6x2 in. Venturi. Boiler. Feed water
- 1 disconnected CO_2 indicator (body only)
- 1 fluid meter from waste-heat boiler main
- 1 temperature recorder on oil lines at auxiliary boilers. 50 to 350 deg.
- 3 fluid meters, one each on three 800-hp. stand-by boilers
- 1 temperature recorder on separately fired superheater; 90 to 800 deg.
- 3 temperature recorders on last pass of three stand-by boilers; 150 to 800 deg.
- 1 CO_2 recorder with three station records. (Inoperative)
- 1 temperature recorder on Curtis turbo; 300 to 650 deg. F.
- 1 voltmeter recorder; 225 to 600 volt
- 1 steam-pressure recorder

Boiler and Power House
- 1 fluid meter. Steam flow to adjacent plant
- 1 temperature recorder. Feed water; 60 to 250 deg. F.
- 1 temperature recorder. Stack breeching outlet; 300 to 650 deg. F.
- 1 fluid meter on air discharge from air compressor
- 1 depth gage for water tank; 0 to 10 ft.

Tank Room
- 6 temperature recorders, 50 to 150 deg. F. On electrolyte; 50 to 150 deg. F.
- 1 low-pressure steam recorder, 0 to 20 lb. on l.p. steam main; 0 to 20 lb.

Anode Furnaces
- 1 fluid meter on waste-heat boiler steam output
- 1 fluid meter on waste-heat boiler steam output
- 1 fluid meter on waste-heat boiler steam output with three records (draft, steam production, and flue exit temperature)
- 1 fluid meter on waste-heat boiler steam output

Blue Vitriol Plant
- 1 fluid meter on steam supply to department; 25 to 30 lb. pressure
- 1 pressure recorder on evaporator steam-pressure coil header; 0 to 30 lb.

The CO_2 Recorder

The carbon dioxide recorder, which, it is claimed, has made it possible to obtain nearly perfect combustion of fuel in furnaces without the use of excess air, is used in some of the plants surveyed. One operator states that it is a valuable aid in watching boiler performance; another reports that he is increasing the use of these recorders, especially where any large amount of fuel is burned, on all boilers and even on kettle settings. The results, he says, are sufficiently good to justify the purchase of the instrument. At the plant referred to in Table I, it is said, these instruments have made it possible to maintain very nearly perfect combustion conditions in the boiler furnaces, which would have been impossible without them. Another superintendent states that he expects to purchase one soon, inasmuch as the recorders are considered helpful to boiler operation. The use of these instruments is apparently not as widespread as it might be.

Industrial Notes

The Mexico City office of the Sullivan Machinery Company, Chicago, has moved from Edificio Oliver No. 1 to Edificio Cook, Dept. 215. The company announces that O. J. Neslage is manager for the territory in Mexico lying south of the twenty-sixth parallel of latitude.

Vanadium Corporation of America, 120 Broadway, New York, has opened an office at 2245 Henry W. Oliver Building, Pittsburgh, under the direction of J. Alfred Miller, Jr., general sales manager.

H. A. Barker, of The Dorr Company, sailed for South America on Oct. 13. The company announces that A. T. Hastings, for several years manager of the Los Angeles office, sailed for Europe on Oct. 20 to join The Dorr Company, Ltd., in London. A. M. Kivari succeeds him at Los Angeles.

Recent Technical Publications

The Story of American Patent Experience

PATENT LAW FOR THE INVENTOR AND EXECUTIVE. By H. A. Toulmin, Jr. New York: Harper & Brothers. Pp. 288; price $4.

AS F. A. SCOTT maintains in an introduction to this treatise, no statistics exist that tell the whole story of American patent experience. How many patents have failed to return to the inventor a just reward; what volume of tribute has been collected by holders of patents that could not have been sustained had anyone felt sufficiently interested to contest them—such details can never be known. That the total volume of maladjustment and injustice has been appallingly great is recognized by every executive whose experience has carried him into the field of patent law. A more intimate knowledge of the subject is the first requisite toward emergence from this unhappy situation. How to acquire such knowledge as an incident of a crowded business or professional career is a part of the problem of many executives.

Colonel Toulmin is the author of an interesting and helpful volume, parts of which have already appeared in the form of magazine articles, in publications such as *The Magazine of Business, Chemical and Metallurgical Engineering, American Machinist,* and *Electrical World.* An introductory chapter on "How to Get a Valid Patent" is followed by advice to the effect that executives should engage the services of patent attorneys before complications have arisen. The big fees earned by lawyers are for litigation that could have been avoided at slight expense, it is maintained.

The author sees no escape from pitfalls by relying on trade secrets rather than on patents, and his arguments in this connection are unanswerable. Chapter IV will be of immense value to inventors, describing, as it does, a complete system of invention records. Subsequent sections of the book discuss "Purchase and License Agreements," and "Who Owns the Invention—the Employer or the Employee?" This leads naturally to the problem of stimulating the flow of new ideas from plant operators. The practice of the Postal Telegraph Company is of interest.. "All of our employees," says one of its executives, "from the highest to the lowest, are encouraged to invent improvements in mechanical apparatus used by the company, and every facility is afforded for this purpose. Whenever an employee produces an invention, he submits it to the chief engineer, who decides if it is of any use to the company, in which event the invention is patented at the company's expense. In consideration for this, the company exacts from the employee-inventor a one-half interest in the patent, but the company agrees that its interest shall be limited strictly to the use of the invention by itself and its affiliated companies. In other words, the company has no right to sell the invention, but only to use it in its own business. If the company, through its chief engineer, decides not to have the article patented, then the employee-inventor is free to do so at his own expense and the company has no interest in the invention. We consider," concludes the statement, "that the product of the employee's brains, while he is on the company's time and making use of the company's plant, belongs to the company to the extent indicated. But the employee-inventor is free to market his invention anywhere else he is able to do so, even to our competitors."

Testimony from those who have introduced a regular invention department for the encouragement of employees is given, which should be helpful to those who have not yet taken advantage of this method of stimulating interest in the work. In subsequent chapters are discussed the methods by which patent infringement may be avoided, the worth of patents and the relation of patents to income-tax return. The author points out the anomaly that exists whereby the law of the land gives an inventor a monopoly on the one hand, by granting a patent, and denies him the fruits of his labor, by the enforcement of the Sherman Act, on the other. Patent pools and patenting in foreign countries form the subject of separate chapters, and the book concludes with an appendix in which is summarized the value of patents and copyrights in the hands of the leading industrial organizations.

A. W. ALLEN.

PLATINUM EXTRACTION—*The South African Mining and Engineering Journal* for Sept. 8 and 15 presents a discussion of the new platinum-recovery process reported to have been developed for the Eerstegluk company. The process, it is stated, is designed to be applied to concentrates produced by flotation, which, in turn, is especially applicable to the sulphide norite ore, in which the platinum occurs. The ratio of concentration sought is twenty to one, the concentrates representing 5 per cent by weight of the original ore and containing probably 90 per cent of the original platinum group of metals. The process in brief is as follows: Pyritic concentrate is dried and roasted for approximately six hours at a dull-red heat to eliminate sulphur and oxidize base metals. It is removed from the roasting furnace, mixed with salt, and placed in the chlorination furnace and kept at a temperature between 500 and 600 deg. C. for about five hours. During this period, chlorine gas is passed over the surface of the heated material, which is not disturbed in any way. This converts the platinum group of metals, also any copper and nickel present, into salts which are readily soluble in acidified water. Immediately after withdrawal from the chlorination furnace, the roasted concentrate is dropped into acidified water, and the salts are washed out. The solution thus obtained is agitated with powdered limestone, which precipitates the copper as green carbonate. The copper precipitate, which contains a minute quantity of platinum, is removed by filtration. Copper and platinum metals present in this precipitate may readily be recovered by smelting and electrolysis. The platinum metals contained in the original solution are precipitated as a black powder by agitating with zinc dust. This powder is removed by filtration and is then dried and raised to a red heat for a few minutes, after which it is ready for refining. The solution remaining after the precious metals have been removed may be given a simple chemical treatment to recover from it the nickel content in a marketable form. Insoluble gangue remaining after chlorination and washing is cyanided in the usual manner to recover the gold in it. The writer gives a figure of 36s. as the working cost. After studying the practice involved, he concludes that this figure must be the total working cost, including that of mining. He is unable to say whether any credit is given in the estimate for copper, nickel, gold, and the other metals of the platinum group recovered.

Further details of the extraction process devised by Messrs. Enzlin and Eklund have been disclosed in the patent specification and are set forth on page 44 of the *South African Mining and Engineering Journal* for Sept. 8. The invention refers to the recovery of gold, silver, and the metals of the platinum group by amalgamation methods. The invention is said to be applicable to sulphide and oxide platinum ores and to both free-milling and refractory gold ores. Although the method can be applied to concentrates, it permits the recovery of metals directly without concentration. It is described briefly in the Oct. 20 issue of *E. & M. J.*, on page 621.

KATANGA MINERALS—*Rocks and Minerals*, published by Peter Zodac, 157 Wells St., Peekskill, N. Y., in its September issue contains a short article on the minerals of the Katanga region, Belgian Congo. The author is Edward Cahen. Some dozen or more minerals of peculiar interest are described in detail for the benefit of the collector, to whom the magazine referred to is devoted.

MINING IN INDIA.—The annual report of the chief inspector of mines in India for 1927, published by the government at Calcutta, has just been received.

NEWS OF THE WEEK

Summary

TECK-HUGHES GOLD has started sinking its new shaft at its property in the Kirkland Lake district. Installation of the hoist, which will be able to lift from a depth of 3,700 ft., is expected to be completed by January. Page 764.

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West Kootenay Power & Light has obtained permission to develop the Pend Oreille River. The power obtained will be used for the Tadanac smelter of Consolidated Mining & Smelting. This company has been temporarily prevented from discontinuing Granby's supply of power for its Allenby mine by the issuance of an injunction. Page 763.

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Placer mining in Alaska has flourished during the last year. The most important operations have been those of Fairbanks Exploration, near Fairbanks, but other districts have been actively producing as well. Page 762.

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Anaconda Copper will reopen the Original mine in the Butte district. It has been closed for more than a year. By reopening this property and the Badger State, Anaconda has provided work for 1,300 more men. Page 761.

* * *

As a result of exploratory activities in the Blue Tier tin field, the Tasmanian government may begin active operation. Page 765.

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Grandview Mines struck 15 ft. of ore in driving its main tunnel in the Pend Oreille district. Company's new mill should be ready early in December. Page 762.

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Mexican government issues reports on silver and quicksilver mining. Production of both metals is increasing. Page 764.

* * *

Trojan Mining, second largest gold producer in South Dakota, is to be reopened. Page 761.

Higher Price for Copper Increases Activities in Michigan District

Quincy Now Producing 200 Tons Daily From No. 6 Shaft and Preparing Nos. 2 and 8 for Production—Seneca Starts Work at No. 1 Shaft—Calumet & Hecla to Start Drilling Cliff

THE recent rise in the price of copper to 16c. per pound has resulted in increased activities in the Michigan copper district, both at the producing and non-producing properties. Quincy Mining, which had not been producing for some time as a result of the fire in No. 2 shaft last year, is now hoisting 200 tons of copper ore daily from its No. 6 shaft, and the mill is in operation intermittently. The tonnage will be increased as soon as the other shafts, Nos. 2 and 8, are again put in operation and new openings started. No. 8 shaft, now bottomed below the 75 level, will be extensively opened and sunk an additional 1,200 ft. Sinking will be started within two weeks. Work on the steel shafthouse, which was removed from No. 7, will be completed in a week, and in the meantime the 75 level is being cleaned out and an air line for the drills constructed in the shaft.

Rapid progress is being made through the fire-damaged portion of No. 2 shaft. In the last three weeks it has been rebuilt from below the 50 level to below the 51 level. The shaft should be in operation again before the first of next year.

In No. 6 shaft, sinking to the 89 level is in progress. New drifts in the 88 level are opening rich ore, according to report. The south drift is in 150 ft. and the north drift an equal distance. Drifts are also being driven on the three levels above the 88. The work of compounding the hoist at No. 6 is under way. This will give it a hoisting capacity of 13,500 ft., equal to that of the hoists at Nos. 2 and 8.

Sampling of the larger of the two Quincy tailing dumps in Torch Lake is nearing completion, the assays showing an average of more than 8 lb. of copper to the ton. The tailing will be treated in Fahrenwald flotation machines, which will be installed in No. 2 mill. Tailing will be removed from the lake by means of a suction dredge, the method employed by Calumet & Hecla at two of its reclamation plants. It is estimated that Quincy has 29,000,000 tons of tailing which can be re-treated with a loss of about only 1 lb. per ton.

Seneca has started work in No. 1 shaft, and development will be extended as more men are employed. The force now numbers about 60. Only one of the two compartments of the shaft is completed at the last two levels, the 8 and 9, and the remaining compartment will be stripped to the standard dimensions and equipped. Sinking and drifting then will be started. In No. 2, the shaft will be completed from the 19 to the 25 level, where it is now only "holed through." New levels will be opened as the stripping proceeds. Thomas S. Cole, a director, and Frederick R. Kennedy, secretary and treasurer of the company, visited the property recently.

At Calumet & Hecla's Cliff property, in Keweenaw County, the bottom level of No. 4 shaft has been cleaned out and diamond drilling will soon begin. At the Phoenix, the bottom level of the incline shaft is being cleaned out. The ground is badly caved. A hoist has been installed to handle ore from the level.

Calumet & Hecla is in good ground in the 11 level north from No. 4 Tamarack shaft. This territory, left intact by the old Tamarack company, is reached through the Red Jacket shaft. Operations in the slope shaft in the Red Jacket branch led to the discovery of this mineralization. The conglomerate below the haulage tunnel is being opened through A and C shafts. C shaft is being sunk from the 92 to the 95 level. The 91 level between the two shafts will be connected by drifts now being driven.

Arizona Magma Plans Construction of a Mill

Operations at the Diana mine of Arizona Magma Mining, 3 miles west of Chloride, Ariz., are progressing, pending the construction of a flotation plant to treat the lead-silver-zinc ore. A pilot mill will be constructed first to treat ores while the mine development is continued. The company is drifting on the 300 level and is developing a body of milling-grade ore at that level. At its Washington Extension mine, drifts are being driven both north and south on the 125 level.

Anaconda Reopens Original Mine in Butte District

ANACONDA Copper will resume production from its Original mine, in the Butte district, according to J. R. Hobbins, vice-president of the company. Work was started at the property on Oct. 29. The mine was closed down on June 30, 1927, for the purpose of effecting repairs and necessary development work, which resulted satisfactorily. After cleaning operations are over, about 700 men will be employed. Production from the mine, which is 3,900 ft. deep, amounts to about 1,000 tons a day. Approximately 500 men are already at work at the Badger State mine, which was reopened a short time ago. The reopening of these two mines will mean a greatly increased copper production from Anaconda's Butte properties, caused by the recent increase in price.

The Original mine was the first claim patented in the Butte district. It was located by five miners in 1864. Anaconda Copper purchased the mine from the late Senator W. A. Clark in 1910.

U. S. Ochre and Pigment Resources Will Be Studied

THE Northwestern experiment station of the U. S. Bureau of Mines has recently completed extensive tests of ochres and mineral pigments of the Northwest in co-operation with the University of Washington. The work consisted in preparation of raw materials to secure satisfactory pigments and studies of the properties of the pigments thus obtained as compared with those in commercial use. These activities are now being extended to a survey of ochres and similar pigments of the entire United States. Methods of preparation will be given particular attention for deposits large enough to have possibilities of development. Twenty-two states have already signified their willingness to co-operate.

Six Properties Developing in Nuka Bay District

Six properties are now under development in the Nuka Bay gold district of Alaska, and two of these are equipped with milling plants. At the Babcock-Downey property, a production of 448 oz. is reported from 150 tons of ore, crushed in a small rotary mill. The vein is 5 ft. wide and assays up to 7½ oz. of gold to the ton.

North Carolina Feldspar Mill Will Start About Dec. 1

Operations at the feldspar mines near Burnsville, N. C., will begin Dec. 1, when the 75-ton grinding plant should be ready, according to Carroll P. Rogers, of Tryon, N. C., president of Feldspar Mining. The plant, built at a cost of $85,000, is now three-quarters finished, and the village built to house the workmen is ready for occupancy. The company, which was incorporated last March, controls 2,000 acres. Plans to increase the capacity of the plant to 150 tons are being made.

Landing Field Being Built at Meadow Creek

A LANDING FIELD is being constructed at the bottom of the canyon in which the Meadow Creek properties of Bunker Hill & Sullivan are situated, so that the company officials may use airplanes in traveling to and from the properties. A flat stretch, about 800 ft. wide and half a mile long, has been cleared of trees, and the stumps are now being dragged or blasted out. Use of a plane will materially shorten the length of time necessary to reach the Meadow Creek properties and also will make trips possible during spring and fall periods when the roads are in bad condition.

Two Companies Formed to Work Claims Near Butte

TWO new companies have been formed recently to operate properties in the southwest part of the Butte district. Butte Southern Mines, Inc., has been organized as a Delaware corporation with a capital of 1,000,000 shares, par value $1, by Colonel A. P. Peake and several Butte mining men. At present the company is unwatering a 120-ft. shaft on the Virgo claim of the Metz group, 3 miles southwest of Butte. The Virgo shaft is being enlarged and retimbered, work already having reached a point 50 ft. below the surface. The Metz group consists of six patented and two unpatented claims.

James E. LaFountain, John A. Roos, Bert Monahan, and their associates have acquired the Olive Branch, Black Hawk, and two other claims in the southwest part of the Butte district. A company has been formed under the name of Butte Olive Branch Mines to develop these properties. It has a capital of $1,500,000.

Trojan Mine to Be Reopened

Trojan Mining, second largest gold producer in South Dakota, which has been shut down since 1923, will resume operation under the direction of C. E. Dawson, who was general manager previous to the shutdown. The financing will be undertaken by Eastern interests, according to report. The Trojan mine is in the Bald Mountain district, Lawrence County, S. D., and consists of 2,100 patented acres. A 400-ton cyanide plant is included in the equipment at the property. Total production at the Trojan has amounted to $4,500,000.

Whitedelf Will Build Mill at Clark Fork, Idaho

W. L. ZEIGLER, mill superintendent of Hecla Mining, is preparing plans for a 60- to 75-ton flotation mill, to be constructed at the Whitedelf mine, in the Clark Fork district, Bonner County, Idaho, according to J. P. Delaney, president of the company. The winze from the main working tunnel has been sunk to a depth of 250 ft., which is 550 ft. below the surface. About 400 ft. of drifting has been done at the 200 level of the winze, and continuation of the orebodies has been proved. Stoping has been begun on the 100 level.

According to the most recent report received by Mr. Delaney, the company has shipped a total of 139 carloads and has about $71,000 in cash on hand. Regal Mining, of which Mr. Delaney is also president, is now installing a compressor and drill at its property on Goat Mountain, in the same district.

Mountain Copper Reopens Its No. 8 Mine

MOUNTAIN COPPER, an English company with properties in Shasta County, Calif., is reopening its No. 8 mine, at Iron Mountain, and making preparations for its operation. The probability of reopening the 350-ton smelter at Martinez has been advanced, but the company states that no decision has been made in this connection. Mountain Copper was organized in 1902 as a reconstruction of a company of the same name, which owned, in addition to the No. 8 mine, the Complex and Hornet mines. The smelter was shut down in 1923. At that time, known ore reserves in the No. 8 mine totaled about 150,000 tons of 2.5 per cent ore. This company was once a large producer, but after 1908 production declined to about 6,000,000 lb. a year.

Childress Is New President of Tri-State Association

Frank Childress, of Childress Lead & Zinc, was elected president of the Tri-State Zinc and Lead Ore Producers' Association at a meeting of the board of directors held on Oct. 30 at Picher, Okla. S. H. Davis, of the Century Zinc Company, was re-elected first vice-president and Edgar Z. Wallower, Jr., was elected second vice-president. A. Neal was re-elected treasurer.

J. D. Conover was employed as secretary and Fred Nesbitt as safety engineer.

Standing committees for the year were announced as follows: Executive—Childress, Davis, C. F. Dike, J. F. Robinson, and George Potter; finance—Wallower, Neal, M. F. Owens, P. W. George and A. M. Gaines; and membership—Gaines, W. T. Landrum, George Pearson, George Provine, and F. N. Bendelari.

Alaskan Placer Mining Has a Successful Season

PLACER-MINING operations in Alaska expanded greatly during the season now drawing to a close. Gold production from the territory should show a substantial increase as a result of these operations.

The most important placer enterprise in Alaska is that of Fairbanks Exploration, subsidiary of U. S. Smelting Refining & Mining, which now has three dredges working near Fairbanks. Two of the dredges are on Goldstream and one dredge is at Chatanika. The smallest dredge, the Gilmore, was constructed in record time. It was ready for operation 73 days after work on it was started.

Alaska Consolidated Gold, of Seattle, is now exploring Forty Mile Creek with a view to the installation of a fleet of dredges next year. Pay gravel varies in depth from 10 to 20 ft. Two companies are working on Canyon Creek, near Moose Pass. Canyon Creek Development reports striking a 30-ft. paystreak, averaging $3 per cubic foot. The gold is difficult to save, however, because of its fineness.

New York Dredging, operating on Nome Creek, 75 miles from Fairbanks, had the good fortune to work in thawed ground. It has a total of 12 miles under lease, the gravel averaging 12 ft. in thickness. Goldsmith Dredging, of Spokane, plans to start another dredge in the Bluestone district. This company reports its recovery at $1,000 a day.

In the Nome district, the seven dredges operating there had produced $600,000 to the beginning of September. The Poorman camp, 6 miles south of Ruby, reports a good clean-up for the season.

Andrus Hydraulic Mining washed 600,000 cu.yd. of gravel on Chittitu Creek during the season, but returns are not yet available. The buildings in the town of Flat, on the Iditarod River, are being moved to clear the way for dredging the townsite, which has been found to carry good pay. The Riley dredge reports a recovery of $14,000 for an eight-day run. Fourteen men are engaged in testing Lost River, at Nome, for tin dredging ground. A number of individual miners working on the Kougarok report a good season.

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Toronto Section of Canadian Institute Holds Meeting

At the annual meeting of the Toronto branch of the Canadian Mining and Metallurgical Institute, held on Nov. 2, Robert A. Bryce was elected chairman, Percy E. Hopkins, vice-chairman, and W. R. Rogers, secretary-treasurer. An address was delivered by Richard Pearce, editor of the *Northern Miner*, who gave a graphic description of his recent 4,000-mile airplane trip across the barren lands of northern Canada. The talk was illustrated with moving pictures taken on the trip.

Calumet & Arizona Miners Receive Safety Award

EIGHT miners of Calumet & Arizona Mining were the principals at an unusual ceremony which was held recently in Bisbee. They were presented with certificates and medals of honor from the Joseph A. Holmes Safety Association in recognition of their heroic efforts to rescue Alfred Ramson, who was overcome by gas while working in a raise in the Junction mine. All of the rescuers were overcome by the gas, but were revived. Ramson, however, was killed. The men who received the medals and certificates were A. Orton, Dan Seed, Tom Matthews, Thomas Mason, Basil Wollman, Earl Skinner, Tom Tyson, and H. M. Hansen. Harry Hoover was also listed among the rescuers, but he was not in town at the time of the presentation.

Washington Silver Mine Obtains Electric Power

A contract was recently signed by Stevens County Power & Light to extend a high-power line 20 miles to the properties of Consolidated Silver Mountain near Daisy, Stevens County, Wash. The contract provides that the power company furnish the mining company 250 hp. over a period of ten years. The power will be used to operate the 75-ton concentrator on the property as well as for mining operations. A. J. Koebel, of Spokane, is president of the company, which produces silver, lead, zinc, and arsenic.

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Montana-Idaho's Spring Hill Plant Treats 225 Tons Daily

The second unit of the Spring Hill cyanide plant of Montana-Idaho Mines Corporation, near Helena, Mont., was recently started, giving it a total capacity of about 225 tons daily. A new tunnel will be driven at the company's Winston (Mont.) properties to tap the silver-gold orebodies at a depth of about 500 ft. from the surface. The tunnel will be 3,400 ft. long. C. W. Newton, general manager of Callahan Zinc-Lead, has been put in charge of all the Montana operations of the company.

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Quicksilver Found in Alaska

New mineral claims have been located at the head of Slippery Creek, a tributary of the McKinley River, in the Mount McKinley and Kantishna districts of Alaska. Deposits of copper, antimony, and quicksilver are reported, the latter associated with serpentine.

Soviet Attempting to Rebuild Manganese Industry

NOW that the Harriman manganese concession of Tchiaturi has ended, the Soviet authorities are endeavoring to tackle the problem of rebuilding the industry to the position which the Poti district had in the world manganese market before the war. Heated words are uttered about the alleged inactiveness and lack of real interest which they allege marked the "Harriman period." Thus the export of Russian manganese ores, which previous to the war (1913) covered about 50 per cent of the world requirements, has shrunk to 18 per cent since 1924, because of the lack of transportation facilities on the Black Sea, despite the doubling of world prices for manganese itself. It is said the intention of the Soviet men is to initiate a vigorous campaign of cheapening the ore as soon as possible, with the view to oust some of the more recent producers, or at least some of the older Indian and Brazilian producers, and to enforce in this way an international understanding. This same policy had some time ago been pursued with regard to platinum with not wholly satisfactory results. People in Germany wonder whether the expected American increase in duty on imported manganese ore will not disturb the fine circle of the Soviets, for until now American legislators may have had some scruples against the prohibition of ore imports of an American concessionary. This condition no longer holds true.

The United States can produce manganese ore to a goodly degree at home, as is not true with platinum. As for the present situation, the sale of all Russian manganese ores from the Nikopol, Kriwoi Rog, and Tchiaturi districts, in many of the more important European markets, has been concentrated with Messrs. Rawack & Grunfeld, at Charlottenburg, which are controlled by the Frankfort Metallgesellschaft. The latter, together with the metal traders Floersheim & Cie., are founders of the Bulgarian Rodopski Metal Company.

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Grandview Mill Should Be Ready to Start Soon

MACHINERY for the 500-ton mill being built in the Pend Oreille district of Washington, near Metaline Falls, by Grandview Mines is now all on the ground and the work of putting the plant in condition for operation is proceeding rapidly. Officials of the company expect that the first ore will be treated between Dec. 1 and 15. In driving the main tunnel, an orebody was struck which continued for 15 ft., according to G. E. Riegel, of Spokane, president of the company. No development work on this orebody will be attempted until the tunnel reaches its first objective, the 1,090-ft. point, where a raise will be started to a glory hole.

Malcolm Muir Elected President of McGraw-Hill

James H. McGraw Continues as Chairman of the Board—Recent Expansion Causes Division of Offices

RECENT expansion of the McGraw-Hill Publishing Company has led to action by the board of directors, the effect of which has been to separate the offices of chairman of the board and president of the company, respectively, both of which have hitherto been held by James H. McGraw. Under the new plan of organization Mr. McGraw will continue as chairman of the board. Malcolm Muir, formerly vice-president, has been elected president of the company and chairman of its executive committee. James H. McGraw, Jr., vice-president and treasurer, has been elected vice-chairman of the board and chairman of the company's newly created publishing committee.

Through merger and purchase in recent months the McGraw-Hill Publishing Company and its nine subsidiary and associated companies now publish, in addition to business and industrial magazines, engineering books, catalogs and directories. Twenty-four magazines serving ten fundamental industries and covering business broadly are published at such widely distant points as New York City, Chicago, San Francisco, and London.

The direct effect of this new coordination of related publishing interests will be to enhance publishing facilities for the group as a whole beyond those which any single paper or lesser group might enjoy. At the same time, as the official announcement of the board of directors points out, these developments have greatly multiplied executive responsibilities and have necessitated a readjustment of the administrative duties of the company's principal officers.

MALCOLM MUIR

Mr. Muir will be the chief executive of the McGraw-Hill Publishing Company, with full authority and responsibility for the operation of the company's business. He has been with the organization for the last 23 years and has been identified with many phases of its activities. In 1917 and 1918 Mr. Muir was general manager for *Engineering and Mining Journal, Coal Age,* and *Chemical and Metallurgical Engineering.* During the last ten years he has taken an active part in each step of the McGraw-Hill company's growth. He has been a leader in the work of the Associated Business Papers, serving as president in 1925-26.

Basin Montana Strikes Continuation of Comet Vein

AT A POINT about 180 ft. from the portal of its north Grey Eagle tunnel in Jefferson County, Mont., Basin Montana Tunnel has opened the western continuation of the Comet-Grey Eagle orebody. At this point, which is 400 ft. west of the former Grey Eagle workings, the vein is 45 ft. wide, and the orebody ranges from 3 to 6 ft. in width. The tunnel is 50 ft. under the surface. This strike has been drifted on for a distance of more than 75 ft.

Ore bins have been erected at the portals of both Grey Eagle tunnels, and plans have been made to ship from the north tunnel within ten days.

Butte & Superior to Sink Main Shaft to 4,000 Ft.

Butte & Superior Mining will sink its main shaft at Butte, Mont., to a depth of 4,000 ft. as the result of diamond-drilling results obtained from the 3,600 level, at present the bottom level of the mine. The main, or No. 3, shaft at Butte & Superior is equipped with a Nordberg hoist designed for an ultimate depth of 5,000 ft. It has a speed of 3,000 ft. per minute and is driven by a 2,000-hp. Westinghouse motor.

Mandy Mines Will Deepen Main Shaft at Flin Flon

DEEPENING of the main shaft of Mandy Mines, in the Flin Flon district of northern Manitoba, is planned by the company, according to M. B. Huston, vice-president. The shaft is now bottomed at 525 ft. This will be increased to 800 or 1,000 ft. A new compressor has been ordered, and while it is being installed the work of deepening the mine will begin.

May Develop Copper Deposits Iliamna, Alaska

New York capital has become interested in the development of copper deposits at Iliamna, Alaska. The great difficulty in carrying on the work is the lack of economic transportation. The Alaska Road Commission has been investigating the situation with a view to constructing a road from the coast to Iliamna Lake, which lies in southwestern Alaska. On the Dutton group, the ore zone is exposed for a width of 50 ft. and a length of 2 miles. On Kasna Creek, the showing is 11 ft. in width and 600 ft. in length. On the Millett group, it is 50 ft. wide and traceable for 3,500 ft.

West Kootenay Power Will Build Plant on Pend Oreille

Power to Be Used for Tadanac Smelter —Granby's Injunction Safeguarding Power Supply Is Continued

THE Department of Lands of British Columbia has raised the reserve on the power rights of the Pend Oreille River, and has given the West Kootenay Power & Light Company, subsidiary of Consolidated Mining & Smelting, the privilege of applying for such rights. The power company has purchased land on both sides of the river for a hydroelectric station and complementary buildings, and is making a survey, preparatory to submitting plans for the plant to the Department of Lands. Development will entail a dam across the river, but, as water diverted will be returned to the river before it enters United States territory, the dam will not affect the level of the river on the south of the international boundary, so consent for its construction will not have to be sought of the International Joint Commission on Waterways. Estimates are to the effect that the new station will have a normal capacity of about 80,000 horsepower and plans now provide that construction will start during the low-water period in the coming winter. All of the extra power is needed at the Tadamac smelter.

The Appeal Court of British Columbia has heard the argument in the case of Granby Consolidated Mining, Smelting & Power vs. West Kootenay Power & Light, in which the plaintiff asked that the injunction restraining the power company from interfering with the normal supply of power at its Copper Mountain mine and Allenby concentrator be made permanent; has reserved its decision; and has continued the injunction until that decision is rendered. The power company asked that the injunction be moderated, to allow it to shut off the current while the transformers are cleaned and other repairs are made. This the court refused to allow, but council for Granby stated that reasonable time for such repairs, the limit of which should be set by the managers of the two companies, would not be considered by the plaintiff as an infringement of the injunction.

Northern Ontario Power Companies Amalgamate

An amalgamation has been effected between Northern Canada Power Company, Ltd., and Northern Ontario Light & Power Company, Ltd., subject to the approval of shareholders at a special meeting to be held in Montreal on Dec. 10. Both companies operate in the mining districts of northern Ontario, and the amalgamation is expected to result in substantial economies and a better service to the mines. A new company will be organized to be known as the Northern Ontario Power Company, Ltd., capitalized at 500,000 shares of no par value.

Mexico City Letter

By W. L. Vail
Special Correspondent

Favorable Reports on Silver and Quicksilver Mining Made by Government

Mexico City, Oct. 29, 1928.—The secretary of the Department of Commerce, Industry, and Labor of the Mexican government has issued a cheerful circular relative to the mining situation, with particular reference to silver production. According to his statement, Mexico last year produced 40 per cent of the world total. The first nine months of the present year show that last year's record has been bettered, despite the closing of several properties because of exhaustion of ore reserves. This improvement, it is said, results from more economic methods of mining on the part of the larger companies. Another favorable feature of the situation has been the absence of serious labor disturbances.

The mining bureau of the department has just completed an exhaustive study of the quicksilver situation in Mexico. Special recommendations are made as to the necessity of insuring the safety of laborers in the quicksilver properties especially, both in working the mines and in reducing the ore. During the first nine months of the year, there has been exceptional activity in the denouncement of quicksilver properties. Most of the operations are on a small scale, however, and comparatively little capital is invested. It is believed that Mexican ores can be worked to good advantage with the adoption of more modern methods and can compete with other sources of supply under the present high prices.

DOLORES MINES has acquired the properties of Concheno Mining, in the Rayon district of Chihuahua. The ore carries gold and silver. The power plant and a 150-ton flotation plant are being remodeled. About 250 men are employed.

The El Cristo mine, operated by Santa Gertrudis, at Pachuca, will be closed. This step will affect about 300 miners, some of whom will probably be transferred to other units of the company.

The Moral Mining Company at Zacualpam, State of Mexico, is installing a new compressor plant at its property to facilitate production. The new flotation plant built by the company is now in operation. Hacienda Calvario, in the same district, has erected a furnace to make periodical runs on lead ores and concentrates.

The mine-labor syndicate in Chihuahua has requested the Department of Commerce, Labor, and Industry to allow the workmen in several small properties recently closed down in the Cuatro Cienegas and Ocampo districts to undertake working the mines on their own account. The mines were closed because of low metal prices.

In accordance with the intention of the incoming President of Mexico, Portes Gil, to bring up the Labor Law and the Workmen's Insurance Act at the session of congress early in December, notices have been sent to representatives of various mining and industrial firms to attend a meeting in this city for the purpose of discussing the proposed revisions as they will be presented by the president. It is understood that this law will be federal in character, oblige workmen and employers to submit their differences to boards of arbitration, and will include clauses regarding occupational diseases, indemnities for injuries and deaths, and a division of profits with laborers. In the meantime, the senate has been requested to desist from discussing projects which have been before that body for some time.

Minerva Mining, operating at Asientos, Aguascalientes, has applied for permission to suspend operations. This property has been a large producer of gold, silver, lead, zinc, and copper. Equipment includes a 750-hp. Diesel engine and a 300-ton concentrator, with flotation plant, built in 1926. Henry Wyman is general manager. It is not known whether the suspension will be permanent.

The Santa Ana mines, in the State of San Luis Potosi, which were reported to have shut down, have been reopened, according to a report from the city of San Luis Potosi. The report states that W. D. Stacpole has obtained a new lease for eight years.

Crown Point Mine Being Developed by Sutro Tunnel

WORK has been resumed in the Virginia City district of Nevada by Sutro Tunnel Coalition, which recently took over the Comstock Merger group, on the Comstock lode, according to Donald Catlin, director of Comstock Tunnel & Drainage, which owns all of the securities of Sutro Tunnel Coalition. The company is working on the Crown Point mine through the so-called transfer shaft of the Comstock Merger on the Hale & Norcross mine.

An entirely new vein on the hanging-wall side of the lode has been found on the 365 level of the Hale & Norcross. This vein has a width of 8 ft. and will be developed more extensively as soon as the airways can be repaired for better ventilation.

South Carolina Gold Mine Is Being Reopened

York Gold Mining, a company composed of Chicago and Duluth interests, is now at work cleaning out an old tunnel and driving crosscuts to cut parallel veins at the York mine, near Gaffney, York County, S. C., according to Dwight E. Woodbridge. Interest in gold in South Carolina is considerable, and several concerns are negotiating for properties.

Toronto Letter

By Our Special Correspondent for Northern Ontario

New Teck-Hughes Shaft Is Down 130 Ft.—Hoist to Be Installed by January

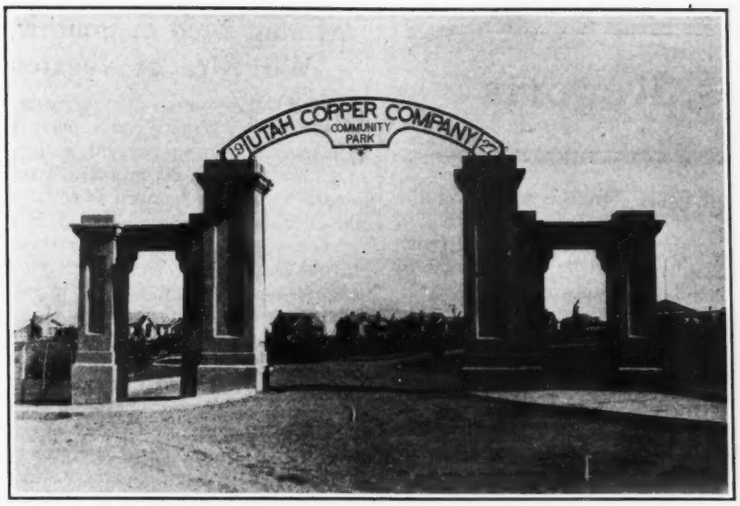
Toronto, Nov. 3, 1928.—Teck-Hughes Gold's new shaft is now down 130 ft. at its Kirkland Lake property, and the company officials expect that the hoist, which can operate to a depth of 3,700 ft., will be installed before the end of January. The dip of the ore deposit, according to report, carries the ore to within 300 ft. of the new shaft at the 3,500 level. The present plans of the company are to sink a winze from this level, with equipment capable of carrying operations to a total depth of 7,000 ft. Work on the old shaft has reached 2,500 ft. and is being sunk toward its objective of 3,000 ft. Crosscuts at the 2,500 and 3,000 levels will connect the old workings with the new shaft when it reaches that depth. The company's two mills are treating about 900 tons daily. Mill heads average about $17 a ton. Ore from the lower levels is averaging about $20.

AT THE Favorable Lake property, sixteen holes were drilled during the summer season, showing an average width of 8.1 ft. for a length of 700 ft. and assaying $12.27 in gold and silver, without either the lead or the zinc content. Three distinct lenses were indicated, with lengths of 100, 250, and 350 ft. Several other veins are known, but these will not be explored until next year, when it is believed the company will send in two additional diamond drills. Costs for drilling this year were $6.51 per foot drilled, which is considered low because of the situation of the property, 270 miles from the railroad.

No material change in underground conditions at the Cobalt mine, of Nipissing Mining, has been reported, but operations at the property in the South Lorrain district are believed to be practically ended. The company's low-grade mill is treating about 200 tons of ore a day.

A ten-stamp pilot mill is in operation at the Thompson-Cadillac mine, in the Rouyn district. A three-compartment shaft has been sunk to a depth of 322 ft. and drifting is being done on the 150 and 300 levels. Ore for the pilot mill is coming from two stopes on the No. 1 vein and from the dump which has accumulated from development work.

A station has been cut at the 3,100 level of Kirkland Lake Gold, in the Kirkland Lake district, according to J. B. Tyrrell, managing director of the company. Sinking will be continued to 3,225 ft. before opening up this level. On the 2,975 level, where development work is being done, favorable conditions have been met.



The entrance to Copperton, Utah Copper's model town in Bingham Canyon, Utah

How One Mining Company Stimulates the Use of Its Own Product

COPPERTON, the residential center built in Bingham Canyon, Utah, for the accommodation of the employees of the Utah Copper Company, is a noteworthy example of modern housing construction, as is pleasingly indicated in the accompanying illustration of the company's Community Park. In addition to the cottages shown, twenty new residences are nearing completion. During the period of construction of the houses built two years or so ago, a large sign erected near by proclaimed the fact that Utah Copper has adopted for its own home town the practices advocated in its publicity proclamation here reproduced. The reader will notice that the buildings are not referred to in the sign as "cottages" or "bungalows," but as "homes," which suggests that the company's community development and welfare work is under the direction of one possessed of understanding of psychologic distinctions.

That in the substantial buildings illustrated the cost of copper shingles, copper gutters, copper down spouts, and brass piping is less than 6 per cent more than if wooden shingles and iron fittings were used demonstrates in striking fashion the substantial economy of using copper as extensively as is possible in building construction of every type.

The slogan "The Everlasting Metal," applied to copper, if used more extensively in publicity matter, should do much to fix in the public mind the great advantages of using copper in all applications for which its characteristics make it especially valuable and appropriate.

Utah Copper tells the world that copper for construction purposes is economical

USE COPPER
THE EVERLASTING METAL
THESE HOMES ERECTED BY THE
UTAH COPPER COMPANY
WILL HAVE
COPPER SHINGLES COPPER GUTTERS COPPER DOWN SPOUTS
BRASS PIPING
THE COST OF WHICH IS ONLY
$310.00 OR 5 1/5 % MORE THAN IF WOOD SHINGLES AND IRON FITTINGS WERE USED
Always Use Copper

New United Verde Employees' Clubhouse Is Dedicated

UNITED VERDE Copper's new employees' clubhouse, created by remodeling and completely refurnishing its old hospital building at Jerome, Ariz., was dedicated recently. Dedicatory address by W. Val DeCamp, general superintendent, short talks by other speakers, and a dance were features of the celebration. The structure occupies a space 42x105 ft. On the ground floor are the employment office, heating plant, and library. The second floor contains a 30x60 ft. dance floor and auditorium. Adjoining the auditorium is a completely equipped kitchen. There is also a ladies' cloak room and lounge. On the third floor are the men's lounge and card rooms.

The entire building is wired for radio and phonograph reception. Loud speakers in all the principal rooms can be connected with the phonograph in the auditorium or with the radio. The building is for the use of United Verde employees and their guests.

Borda Company to Suspend

Borda Antigua y Anexas, working the Carmen de Virgenes group, in the Tlalpujahua district, Michoacan, has definitely decided to suspend operations at the end of the year. This is a silver-gold property, controlled by Las Dos Estrellas, and employs about 150 men.

Tasmanian Government Will Drill Blue Tier Tin Field

AS THE result of investigations conducted by the Tasmanian Geological Survey in the Blue Tier tin field, the government of the province proposes to explore the known deposits thoroughly by means of diamond drill and other prospecting work. This field lies in the northeast of the island, a district from which large tonnages of tin have been recovered, principally from alluvial mining by such companies as the Briseis and Pioneer. Today all the alluvial deposits have been exhausted and the future of the field depends on the development of the lode deposits.

It is estimated that 2,000,000 tons has been mined and treated, of which the Anchor mine, formerly controlled by a London company, was the principal producer. Available reserves are believed to be large, but the average grade is very low, about 0.2 per cent.

A committee has been appointed to supervise operations and an amalgamation of private interests in the field has been arranged. If it can be proved that 30,000,000 tons of ore is available, averaging the grade mentioned, it is believed that conditions would warrant the formation of a company to work the deposits on a large scale. With hydroelectric power available from the government supply, one of the problems which has hitherto militated against the success of operations has been solved.

Howe Sound Forms Company to Operate Kootenay King

SHAREHOLDERS of Kootenay King Mining ratified the agreement by which Howe Sound will undertake development of the property near Fort Steele, B. C., at a general meeting held recently in Vancouver. Salient points of the agreement are that Howe Sound will assume the balance of $40,000 owing by Kootenay King on the bond, that it will equip the property with the operating and concentrating plant as ore reserves may warrant, and that it will pay Kootenay King $250,000 in cash, in return for which it will obtain a three-quarter interest in the properties.

A new company will be formed with an authorized capital of $1,000,000, divided into 4,000,000 shares. The Kootenay King properties will be transferred to the new company in consideration for 1,000,000 shares, and the remaining 3,000,000 shares will be placed in escrow, to be delivered to Howe Sound on the completion of its obligations. If Howe Sound fails to complete its obligations, all the stock will revert to Kootenay King.

According to the agreement, development is to be started on or before May 15, 1929, but, as a matter of fact, Howe Sound has sent a gang of fifteen men to augment those already at the property, and, if it is possible to erect a camp before the cold sets in, work will be continued steadily throughout the winter.

Societies, Addresses, Reports

Canadian Institute Will Meet at Vancouver on Nov. 21

THE annual general Western meeting of the Canadian Institute of Mining and Metallurgy will be held this year in Vancouver, Nov. 21 to 23. In recent years the Institute meetings, both of the parent body and of the division in British Columbia, have attracted a large attendance, comparable to the attendance at similar functions in eastern Canada. The sessions will be held in the Hotel Vancouver, and will be opened Wednesday morning with an address by the president of the institute, R. H. Stewart. This will be followed by the presentation of a review on conditions and mining developments during the year in British Columbia by the provincial mineralogist, J. D. Galloway, and the resident engineers of the respective mineral survey districts. The afternoon will be devoted to a survey of the situation in Manitoba by Dr. J. S. DeLury, professor of geology at the University of Manitoba. H. B. Lumsden, of the natural resources department of the Canadian Pacific Railway Company, will discuss the important nonmetallic resources of that province. At the morning session on Thursday, the oil situation in Alberta will be discussed by P. D. Moore, field geologist for the Imperial Oil Company, and S. G. Coultis, production engineer for the Imperial Oil Company, on the Turner Valley oil fields. In the afternoon the main topic of discussion will be that of mining methods employed in British Columbia, introduced by J. I. Moore, of Britannia; D. Thompson, of Consolidated M. & S.; and representatives of the Granby and Premier companies. On the third day of the meeting the feature will be a discussion on desirable revisions to the placer mining act and the mineral act, with papers on the subject by A. M. Whiteside, L. A. Bonner, R. W. Haggen, and others.

Among other contributions that have been promised are the following: "Use of Solid Fuels in the Pulverized State for Power and Other Purposes," by E. S. Malloch, of the Mines Branch of the Dominion Department of Mines; "The Coal Situation in Alberta," by J. I. Richards, acting chief inspector of mines in Alberta; "Geology of the Topley Area," by Dr. T. C. Phemister, of the University of British Columbia; "Geology and Mineral Resources of the Portland Canal," by R. Hodson; "Production of Copper at Britannia from Mine Waters," by F. Ebbutt; "Milling Practice at the Premier Mine," by Dale L. Pitt; "A Solution of Fault Problems," by G. V. Douglas; and "Pioneer Methods of Placer Mining in British Columbia," by H. Jones.

Social functions include official luncheons on the three days of the meeting, and a dinner followed by a dance on the evening of Nov. 23.

Mother Lode Miners Hold Conference at Mariposa

AT Mariposa, Calif., on Oct. 25, a regional conference of the Mother Lode counties of California was held. Fred Stevenot, State Director of Natural Resources, presided at the meeting and gave an address on conservation of natural resources. C. S. Knight, of the California Development Association, discussed the influence of mining on the prosperity of the community. A. G. Wishon, president of San Joaquin Light & Power, dwelt on the efforts of his company to co-operate with the miners. J. E. Mansbarger, of the *San Francisco Chronicle*, addressed the meeting on the power and influence of the press. A general discussion of local problems closed the meeting.

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Student Organization Meets at Missouri School of Mines

The Missouri Mining and Metallurgical Society of the Missouri School of Mines and Metallurgy, at Rolla, Mo., held its first meeting on Oct. 17. About fifty students were present at this meeting, which was opened by Prof. D. T. Walsh, assistant professor of metallurgy, who outlined briefly the function and workings of the society. The following officers were elected for the ensuing year: James S. Reger, of Vernon, Tex., president; Dr. C. L. Dake, of Rolla, Mo., vice-president; J. H. Hahn, of Muscatine, Iowa, secretary; and W. L. Couch, of Hannibal, Mo., treasurer. Plans are under way to secure speakers at different intervals throughout the year to lecture before the society on the different phases of mining, metallurgy, and geology.

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Utah Academy of Sciences Holds Annual Meeting

At the annual meeting of the Utah Academy of Sciences held Oct. 26-27 at Brigham Young University, Provo, Utah, the following papers of interest to members of the mining profession were presented:

"Surface Measurements of Fine Particles," by John Gross and S. R. Zimmerly.

"The Problem of Rapidly Determining Minerals in Flotation Tailings," by R. E. Head and A. L. Crawford.

"The Flotation of Copper Carbonates," by A. M. Gaudin.

Mining Men of Southwest Will Meet at Nogales

MINING men of Arizona and Sonora, Mexico, have been invited to attend a mining revival at Nogales, Ariz., on Nov. 19, 20, and 21. Governor Fausto Topete of Sonora is to be a special guest of the revival.

Among those scheduled to speak are Harold B. Menardi, Southwestern Engineering Corporation, and J. J. Jakosky, consulting engineer, both of Los Angeles; Dean G. M. Butler and Dr. E. P. Mathewson, both of the University of Arizona College of Mines and Engineering; P. G. Spilsbury, president, Arizona Industrial Congress; Harry A. Clark, governor of the Arizona chapter of the American Mining Congress; and Dr. A. L. Gustetter, chairman of the Nogales Chamber of Commerce mining committee.

The purpose of the meeting is to study and discuss the needs and problems of the mining industry in this particular region. Sponsors of the meeting are the Arizona Industrial Congress, Arizona chapter of the American Mining Congress, Arizona section of the A.I.M.E., and the mining committee of the Nogales Chamber of Commerce.

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Michigan College of Mining Has Record Freshman Class

ENROLLMENT at the Michigan College of Mining and Technology at Houghton is 390. Of the 158 freshmen in the college—the largest entering class in the history of the institution—48 are registered for mining engineering; 17 for metallurgical engineering; 9 for chemical engineering; 4 for chemistry; 21 for civil engineering; 22 for electrical engineering; 14 for general engineering; 18 for mechanical engineering; and 5 for geology.

Registration in mining and metallurgy is almost identical with last year. The increase is in additional courses which the last Michigan Legislature authorized. The increase is taken to indicate how the action of the Legislature enables the college to serve the needs of technical education in the Upper Peninsula of Michigan more fully than ever before.

More than 60 students are taking work in electrical engineering, one of the new courses.

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Phelps Dodge Will Build New Hospital at Bisbee

Erection of a new Copper Queen hospital and a new nurses' home at Bisbee, Ariz., will begin in the early part of December, according to a recent announcement by J. P. Hodgson, manager of the Copper Queen branch of Phelps Dodge. The new hospital, which it is estimated will cost between $75,000 and $100,000, will have a capacity of 40 patients. It has been planned under the direction of Dr. George A. Bridge.

MARKET AND FINANCIAL NEWS

European Metal Problems

By Dr. James Rubinfeld
Special Berlin Correspondent

A QUESTION of paramount importance to European metal producers at present is that of the future relations of the metal industries of the United States to those of Europe. Is there any likelihood that some combining of interests for special purposes may materialize some day in the field of zinc, lead, or aluminum, as is already the condition within the Copper Exporters, Inc., of Brussels, for copper? As for zinc, some people ascribe the dullness of it in London to the reckless American overproduction, which, in turn, has been made possible by withholding European zinc from the American shores through high protective duties, a condition which is even more noticeable for lead. But the course of things, so runs the argument, has only been to make for irregular output and market policies across the Atlantic, whereas the connivance of American authorities in adopting the provisions of the Webb-Pomerene Act to copper has lent strength to this commodity to the advantage of all concerned. It is stressed that only the active help of the American group will make the European Zinc Institute, of Brussels, stand on its feet, and not the passive benevolence of an American observer which has been a common appearance in past international conferences.

The regret about the American attitude waxes into bitterness in the case of aluminum. People are groping about in the dark as to the intentions of the Aluminum Company of America as regards the highly enhanced production in Canada and elsewhere, as well as its interests in Italy and Norway. The German raw aluminum producers, which are to be directly identified with the German state in ownership, are likely to bring forth the alleged "dumping" danger threatening from America, and to plead for protective duty as an equivalent to the entry control which now rules, but which is soon to disappear because of resolutions of the Economic Committee of the League of Nations of Geneva. The provisions now ruling are to the effect that every would-be importer has to give notice beforehand of the prices and conditions of the foreign shipper, in order that the domestic producer will be enabled to compete for the same business under the proposed conditions. Through this order of things the latter is enabled to minimize the extent and importance of foreign competition, though it may not be intended to combat it directly. This is the system now in effect, which is to be abolished, although German producers — including aluminum rolling mills and manufacturers—contend as absolutely certain that the American aluminum trust is bidding in Europe as well as in the Far East and British India at prices which are "dumping" prices in every case. Though, as a matter of fact, there are no duties on raw-stuffs in Germany, this principle is to be encroached upon by the imminent danger which, according to many, exists. On the other hand, the fate of the movement remains uncertain so long as the Reichstag fails to speak. Opponents of such a movement are stressing the fact that under the existing European Control agreement it has been necessary in the past to permit the importation of French raw aluminum into the country. Also, they point out that Great Britain has no duty on aluminum, either.

In the meantime another foe is threatening the raw aluminum industry of Germany. The much lighter magnesium alloys, particularly the so-called "elektron" metal, are being monopolized by the biggest chemical combine of the world, the I. G. Farbenindustrie, which has made vast strides in recent years and now finds application in fields where hitherto aluminum alone ruled, particularly the airplane industry.

Contrary to practice in France, where magnesium is being produced from chloride of magnesium also, the electrolytic process in Germany is restrained to other materials such as original potash salts. Further, there are in Germany no magnesium-copper alloys which are regarded as practicable. Research work on the "elektron" metal is being pursued apace and is promising to give excellent results. The United States already imports considerable quantities of it, and negotiations have been, I learn, entered into by American rolling mills in connection with licenses soon to be granted by the I.G.

Expectations which had been cherished in Polish Upper Silesia with regard to the rapid development of the zinc industry through the activities of Harriman and Anaconda are materializing, albeit somewhat slowly. The electrolytic refinery at Giesche is still in a very initial state, and the zinc retorts have been remodeled or renewed. Anaconda Copper company appears to have obtained important fiscal advantages from the Polish government which formerly had been denied to the Giesche heirs. The latter had not, moreover, had the wherewithal to renew or overhaul the plants in a modern way. The electrolytic refinery of Giesche Spolka Akcyina (as it is named) is believed to have a capacity of 60 metric tons daily, but it is now producing only about ten tons monthly.

In addition to the Giesche-Anaconda trial plant, the Silesian Zinc Company, of Lipine, and the more recent Hohenlohe Works are to erect electrolytic zinc plants. At present, however, the entire zinc production of Polish Upper Silesia amounts to some 12,000 tons as a monthly average, against 14,120 tons previous to the World War. Giesche's are producing about 3,700 tons (to which may be added the production of 1,200 tons from the Eastern Polish smelter at Trzebinia), the Silesian Company 5,200 tons, Hohenlohe 1,900, and Prince of Donnersmarck, 1,100 tons. The monthly average of the whole zinc production in Polish Upper Silesia had, it is true, attained only an average of 6,476 tons in 1924, so that some progress has been made, which would be even greater were it not for the price dullness in London. Therefore all Silesian zinc producing firms, the Anaconda included, are warm partisans of a world agreement on prices. I am informed that the Silesian Company, of Lipine, has acquired for Poland the newly proved Super-Grillage treatment process for the recovery of zinc from ores. In this process the combined Belgian firms, S. A. Cie. des Metaux Overpelt-Dommel, Corphalie, Metallurgique de Boom, and La Nouvelle Montagne, are participating.

The Soviet commercial representative at Berlin is giving notices about the zinc resources of Russia. The lead-zinc fields of Tetjuche, in the vicinity of Vladivostok, are situated only 40 kilometers from the sea coast, and are being exploited in a concession by the British firm of Briener & Company, which exports the ores to Japan and England. In the northern Kaukase (Sadon), there are deposits of low-grade silver-lead-zinc-iron ores which are treated only as pyrites. The Soviet's most important item is the alleged great field of the Ridder, on the Altai slopes, to which German experts are invited to give consideration. The visible supplies have, according to the Soviet official, a zinc content of 2,000,000 metric tons. Thus far the biggest shipment of ores and concentrates from this field has been only about 5,000 tons yearly.

Fluorspar Duty Increase Approved

By Paul Wooton
Special Washington Correspondent

AN INCREASE in the duty on the metallurgical grade of fluorspar was approved by President Coolidge on Oct. 17. Under this order $8.40 per long ton will be collected on imports of this commodity after Nov. 17. The present duty is $5.60 per long ton. The effect of this change in the tariff rate will be to move eastward the line bounding the consumers' territory to which domestic producers can ship. There is still a question as to whether or not they will be able to compete with the foreign product along the Eastern seaboard.

Foreign producers denied access to their cost data, but information as to methods of operation, wages, and prices was gathered in detail by the representatives of the commission. The value of foreign plants was determined and the cost of transportation from the plants to this country was calculated.

An engineering estimate of the extent of domestic resources was made by the commission. This indicated that reserves are sufficient to supply domestic demands for metallurgic and ceramic grades for as much as 30 years.

England was found to have been the principal competing country during 1925 and 1926. In 1927 more of the imports came from Germany than from any other country.

The Tariff Commission's engineers made the following estimates, on a short-ton basis, of the cost of producing fluorspar at domestic mines: Crude ore, $6.97; cleaned ore, $8.80; metallurgical lump fluorspar, $15.98; metallurgical ground fluorspar, $20.77. The cost of selling was found to be $1.17 per short ton.

Philadelphia is the principal port of entry of imported fluorspar. The cost of imports at that port, reduced to a short ton basis, are estimated as follows: Cost at foreign plant is $7.15; foreign inland freight, $2.11; marine freight and insurance, $2.84, making the cost at Philadelphia before the payment of duty $12.10.

The commission also ascertained the cost of foreign fluorspar at the principal consuming centers, as well as the cost of the domestic product at Pittsburgh and other centers of consumption. The report to the President contains a detailed market study showing the distribution of both domestic and imported fluorspar in the various grades.

Though some uncertainty exists as to the extent to which the new rate of duty will affect prices, it is certain to mean that the American mines can be operated much more nearly at capacity than at present.

In its report to President Coolidge on fluorspar the U. S. Tariff Commission summarizes its findings of facts as follows:

1. England is the principal competing country for metallurgical fluorspar and for fluorspar as a whole regardless of the grade.

2. The change of duty indicated by the cost data obtained by the commission applies and is limited to metallurgical fluorspar, or fluorspar containing not more than 93 per cent of calcium fluoride.

3. The present duty of $5.60 per long ton (equivalent of $5 per short ton), prescribed in Paragraph 207 of the Tariff Act of 1922, does not equalize the differences in costs of production of fluorspar in the United States and in said principal competing country.

4. The differences in costs of production of fluorspar of the metallurgical grade in the United States and in said principal competing country are greater than the amount of the present duty of $5.60 per long ton increased by the total maximum increase authorized under Section 315, irrespective of whether the cost comparison is limited to factory costs of production or whether it includes the transportation costs of domestic and foreign spar to Philadelphia, the principal port of entry and principal market in the United States for the imported fluorspar, or to the Pittsburgh district, the principal market for the domestic fluorspar and the largest fluorspar market in the United States.

5. The rate of duty shown by said differences in costs of production of fluorspar of the metallurgical grade containing not more than 93 per cent of calcium fluoride, in the United States and said principal competing country, necessary to equalize said differences within the limit provided in said Section 315, is the rate of $8.40 per long ton (equivalent to $7.50 per short ton).

The commission found that the average cost of producing crude ore in the United States and hauling it to the mills is as follows: Labor, $2.57 per ton; power, 47c.; other expense, 92c.; depletion or royalty, 69c.; depreciation, 72c.; overhead 98c.; haulage to mills, 14c. This makes a total of $6.49. Addition of items which could not be segregated brought the total cost of crude ore to $6.97.

Carrying the process further so as to include the cost of lump sorting and haulage, the imputed interest and other items, the United States cost of metallurgical fluorspar was found to be $20.64 per ton. The British cost of production was found to be $7.15 per ton. The cost of transporting the domestic product to Philadelphia was $7.50 per ton. The transportation cost to that port from England was $4.95. Without considering the selling cost, which is $1.17 per ton, the domestic cost exceeds the foreign cost by $16.04 at Philadelphia. At Pittsburgh the domestic cost exceeds the foreign cost by $10.13. As a result of the President's order, $8.40 per ton now will be added to the cost of imported supplies.

London Financial News

London, Oct. 23, 1928.—Although it shows working profits to have been £189,740 higher, at £525,580, and reveals other improvements over a year ago, the report to June 30 of Sub Nigel, Ltd., has had a mixed reception. During the last year, out of 494,012 tons mined, only 251,300 tons was milled, yielding 19.706 dwt. of gold per ton—a yield higher than the gross content of present reserves. Costs were slightly reduced, so that a working profit of 41s. 10d. per ton milled was obtained. The dividend was 65 per cent, against 37½ per cent, and the shares have declined since the report was issued.

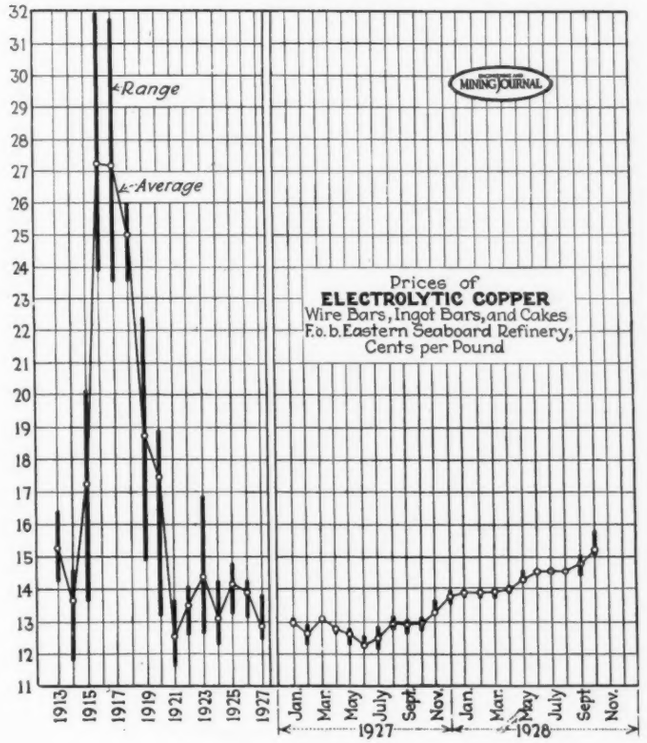
Continued encouraging developments at the properties of Panama No. 1, Ltd. (Panama Corporation's first subsidiary), have, I am informed, led the company to hasten with the equipment of mine and mill, so as to reach the gold-producing stage. The additional working capital which will be required is soon to be raised, and existing preferred shareholders are to be given preference to subscribe. Stanley Low, the corporation's consulting engineer, will leave for Panama next week.

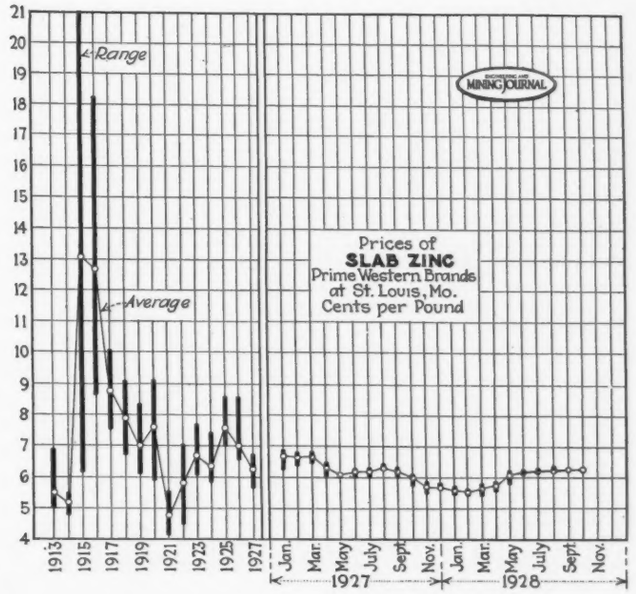
Although production of zinc rose from 48,605 tons to 49,117 tons, lower outputs of lead and silver, together with an all-round decrease in metal prices, have been responsible for a reduction in the profits of the Electrolytic Zinc Company of Australasia. The net figure for the year to June 30, 1928, is cabled over as £363,025, comparing with £390,077 for the previous year. The dividend is unchanged at 12 per cent. I understand the report will refer to developments concerning new orebodies to which attention is being devoted on the West Coast, and to the strengthening of the company's position in relation to future supplies of zinc concentrates.

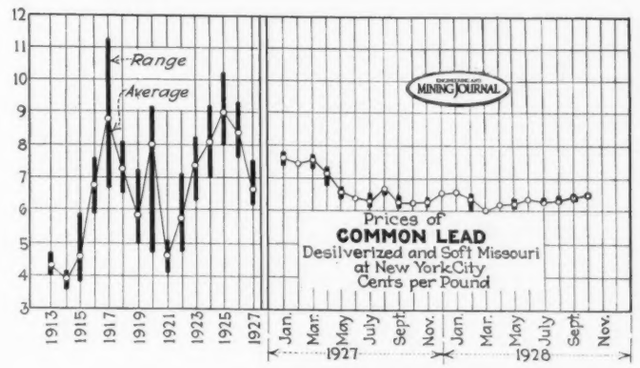
Gold and tin are to be worked by dredging and sluicing in the Hot Springs district of Alaska by a £250,000 company which is being floated here. The Alaska Gold Dredging Company, Ltd., will issue tomorrow 200,000 £1 shares at par, and the prospectus will show that its property is situated 120 miles west of Fairbanks.

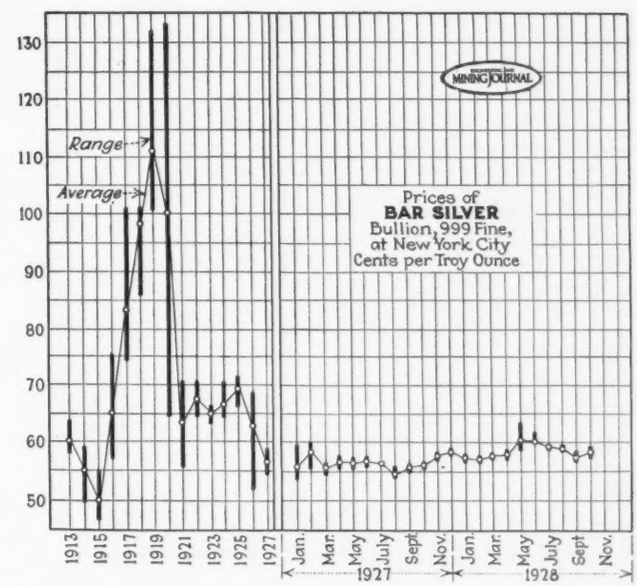
So great is the demand for asbestos that the 16,351 tons produced by the Rhodesian & General Asbestos Corporation in the six months to Sept. 30, 1928, had to be strictly rationed among buyers. Now that constructional work at the Shabanie mine is completed, however, the operators expect gradually to increase the output of fiber from about 1,640 tons to 2,300 tons, and ultimately to 3,000 tons per month, a rate which will involve the handling of about 10,000 tons of rock per month. Sir Edmund Davis, the chairman, told shareholders at last week's general meeting that reserves at the three mines were equivalent to 164,673 tons of fiber, and that he hoped the increased equipment would enable the company to meet soon the very large demand for its grades and also to supply lower grades than have hitherto been produced.

Metal Price Curves

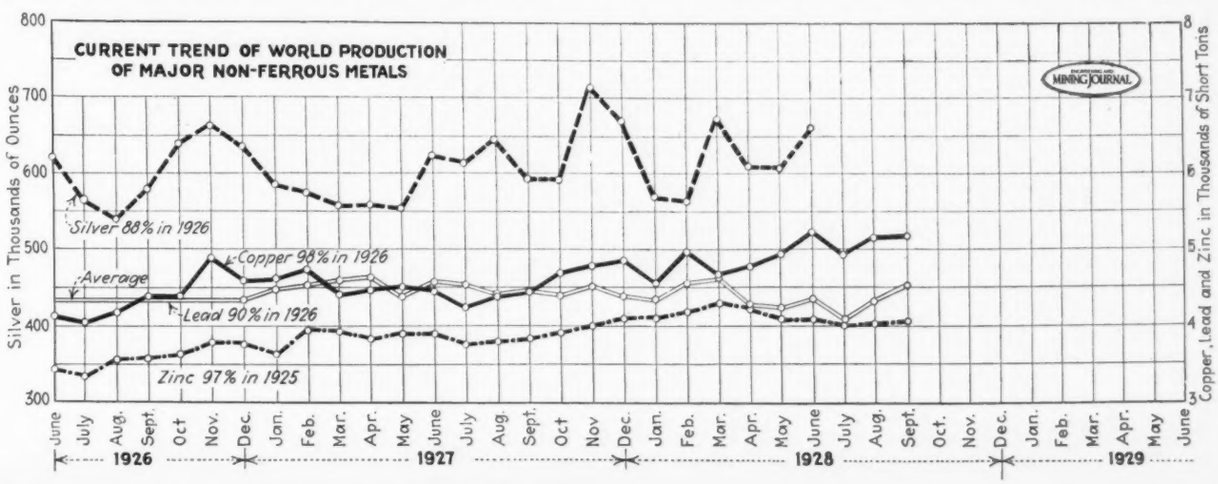








THE CURVES below are not to be considered as permanent records of production. They show merely the current trend in terms of daily output according to the latest estimates of the American Bureau of Metal Statistics. The figures represent production from countries that produce approximately 98 per cent of the world's copper, 97 per cent of the zinc, 90 per cent of the lead, and 88 per cent of the silver. The figures for lead on the new basis are not available for the individual months of 1926, and accordingly the horizontal line showing the monthly average reduced to a daily rate is shown. Delay in receipt of statistics from Mexico accounts for the failure of the silver curve to be up to date.


CURRENT TREND OF WORLD PRODUCTION
OF MAJOR NON-FERROUS METALS
Silver in Thousands of Ounces
Copper, Lead and Zinc in Thousands of Short Tons
Silver 88% in 1926
Copper 98% in 1926
Average
Lead 90% in 1926
Zinc 97% in 1925
June July Aug. Sept. Oct Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct Nov Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June
1926
1927
1928
1929

Review of Current Statistics

By Homar L. Johnson
Assistant Editor

AN INCREASE of 0.478c. per pound in the average price for electrolytic copper was largely responsible for the advance in *E.&M.J.'s* Weighted Index of Non-Ferrous Metal Prices for October. Smaller advances in lead, silver, and tin prices over the September averages were recorded also, although their relative importance in advancing the Index number is insignificant. Prices of zinc, nickel, and aluminum underwent no change. At 102.34, the October Index number registers the highest point achieved since November, 1926.

Following the tremendous buying in September, many copper producers had expected a considerable interval of slackened demand. A period of buying apathy did set in, though it was of short duration, lasting only two weeks. Release of the September statistics did much to crystallize the opinion of buyers that further price advances were likely to occur in the early future, particularly in view of the further reduction in stocks of refined copper. Consequently, buyers expected higher prices, and chose to cover their requirements further ahead than had been their practice in the recent past, and brought higher prices upon themselves. Producers have gone out of their way to issue warnings that rumors of a "copper shortage" in the first quarter of 1929 were without foundation in fact and that a more orderly buying practice would result in greater satisfaction to all concerned. Reiteration of this advice appears to have borne fruit, for at the time of writing—Nov. 7—buying activity has lost its tempestuous panicky appearance and the price rests at 16c. per pound, delivered Connecticut Valley basis.

A most apparent result of the rapidly ascending copper price was the almost parallel advance recorded by share quotations of copper-mining company stocks—an advance that was correspondingly rapid for the mining-smelting-manufacturing shares, most of which represent some interest in copper. Rumors and reports relating to the proposed "Nickel" merger had much to do with the appreciation of International Nickel shares which was largely responsible for the record advance recorded by the mining-smelting-manufacturing Index number, however. A result of the latest skyrocketing exhibition of International Nickel shares was to place the stock market valuation of that company well above $300,000,000, where it surpasses the stock-market valuation of Anaconda, its nearest rival, by close to $50,000,000. The October Index Number is 276, which compares with 194 in January, 1928, and 144 in January, 1927. Major advances in A.S.&R. and Anaconda shares, likewise, aided in the October advance.

The extent of the investing public's optimistic analysis of copper shares during October is attested by the fact that not a single decline was recorded by a company of the group making up *E.&M.J.'s* Index of the common share valuation of fourteen copper-mining companies. An advance of 20 points by Kennecott, 7 points by Chile, and 5 points by Nevada Consolidated accounted for approximately 75 per cent of the total advance. Among the other companies to undergo large appreciations in share quotations, which do not have a corresponding effect on the Index because of smaller capitalization, the advances recorded by Calumet & Hecla, Granby, New Cornelia, and United Verde Extension are noteworthy. The October figure, 192.8, is 27.2 points above the September number, which constituted a record up to that time.

E.&M.J. Weighted Index of Non-Ferrous Metal Prices

100 Is Composite for 1922-3-4

1920	130.92
1921	80.80
1922	93.94
1923	103.43
1924	102.63
1925	111.74
1926	107.74
1927	97.54

	1926	1927	1928
March	108.95	100.84	96.22
April	105.93	98.63	97.14
May	105.43	96.41	99.05
June	106.68	95.55	100.16
July	109.08	95.42	99.69
August	110.22	97.25	99.85
September	109.27	96.01	100.53
October	106.20	95.36	102.34

The October Weighted Index of the thirteen miscellaneous mining company shares is absolutely unchanged from September. Advances in share value recorded by Hollinger, Federal M.&S., Homestake, Hecla, and Premier Gold were offset by depreciations in share value of St. Joe Lead, Cerro de Pasco, Lake Shore, Tintic Standard, Utah Apex, and Cresson Consolidated. Perhaps the outstanding feature of this group's stock exchange behavior last month was the arresting of Hollinger's long-continued and outstanding share-price depression.

Daily rates of world production of copper, lead, and zinc were higher in September, the last month for which detailed statistics are available. Copper and zinc were only slightly higher, but the rate of refined lead output increased nearly 150 tons per day, in which increase domestic producers participated largely. United States stocks of refined lead declined approximately 1,600 tons, despite the higher production prevailing, which indicates an improvement in consumption. Stocks of blister and refined copper were lower by another 2,000 tons on the first of October, and it is to the publication of this figure in mid-October that the latest buying wave is indirectly attributable. Domestic shipments of copper to consumers have established successive new high records each month since May of this year. The September total, 88,707 tons, exceeds the August total by 5,309 tons, although export shipments declined 9,000 tons during the same period. The recent buying tendency—of covering requirements further in advance—is increasing the total of unfilled orders for copper at a rapid rate.

Even among the primary producers there are few who commend the practice of buying for long-delayed delivery — although during the recent sharp demand all primary producers took their proportion of the forward business throughout the period of activity. Higher prices for fluorspar and feldspar result in a slight advance in *E. & M. J.'s* Weighted Index of Non-Metallic Minerals for October.

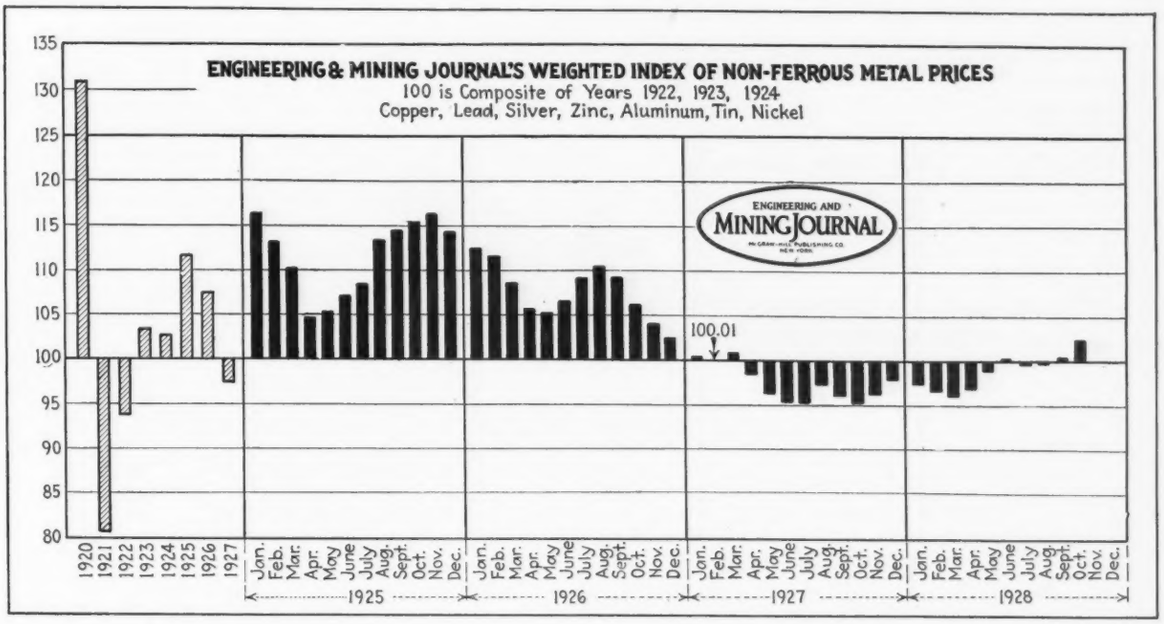
Current Statistics of Production and Stocks of Copper, Lead and Zinc

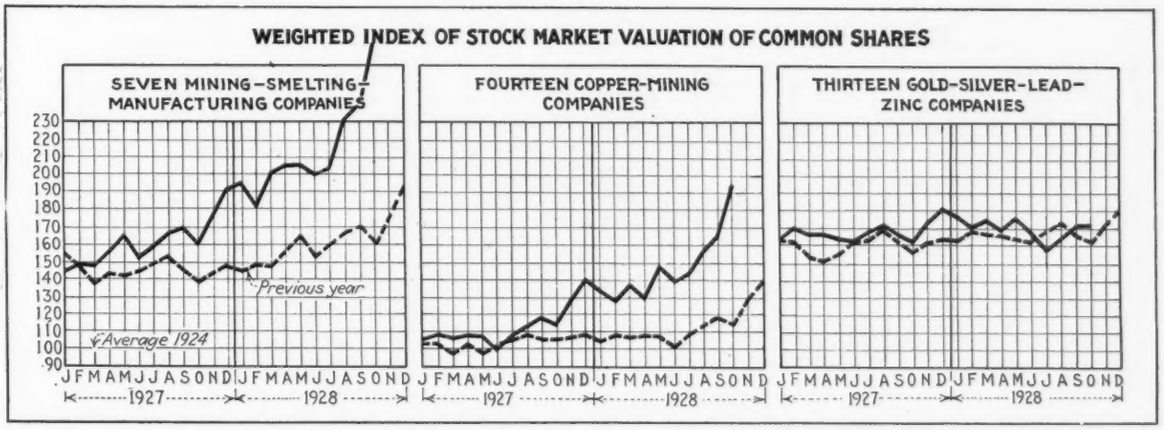
Data from American Bureau of Metal Statistics

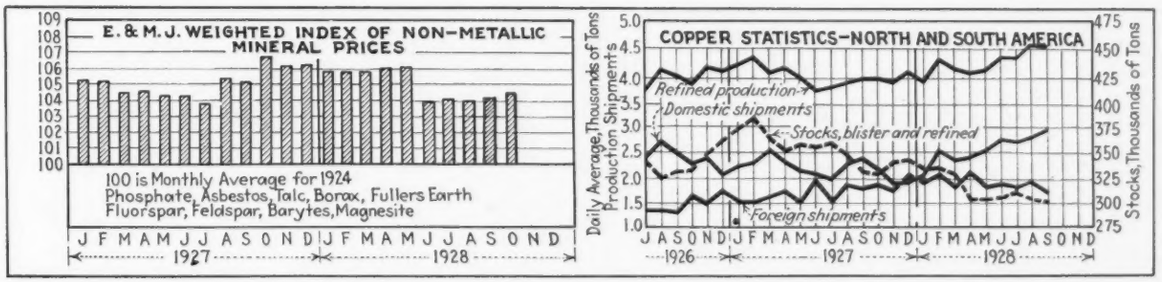
Figures Represent Short Tons

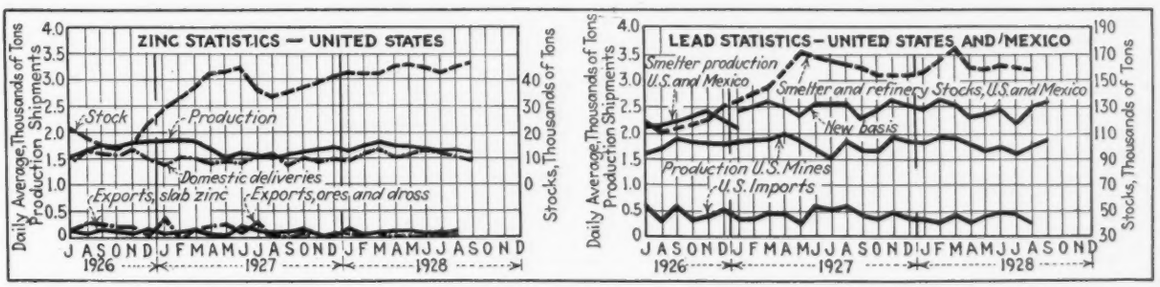
	1927		1928		
	Average	September	July	August	September
COPPER—North and South America					
Production, refined, daily average	4,045	3,970	4,358	4,631	4,567
Domestic shipments	68,737	71,578	82,245	83,398	88,707
Foreign shipments	53,489	54,683	56,785	60,240	51,292
Stocks, blister and refined	351,611	333,010	312,544	309,226	307,434
LEAD—United States and Mexico					
Production, smelter, daily average	2,513	2,367	2,219	2,499	2,518
Production, U. S. mines, daily average	1,798	1,700	1,570	1,780	1,855
Imports into U. S. A.	13,451	12,134	14,272	11,699	.....
Stocks, smelter and refinery	156,878	160,134	158,919	156,976	155,385
ZINC—United States					
Production, daily average	1,681	1,591	1,642	1,682	1,645
Domestic deliveries	45,811	44,038	49,510	47,050	44,103
Exports, slab zinc	3,468	4,673	2,145	2,923	.....
Exports, ores and dross	4,424	849	221	463	.....
Stocks	37,602	34,277	42,210	44,416	47,915
World Production Rate (Daily average)					
Copper	4,543	4,443	4,942	5,124	5,151
Lead	4,514	4,475	4,170	4,350	4,512
Zinc	3,910	3,824	4,013	4,027	4,049

E.&M.J. Statistics of the Mining Industries









The Market Report

Metal Markets Quiet; Prices Firm

Demand for Copper Abates and Close-to-Normal Business Is Done in All Metals

New York, Nov. 7, 1928—The scramble for copper indulged in by fabricators and other consumers of that metal late in October has quieted down. Business in all of the major non-ferrous metals during the last week has been in close-to-average volume. The price of copper is firm at 16c. per pound, delivered Connecticut Valley basis. Lead is unchanged at 6.50c. per pound New York. Prime Western zinc remains at 6.25c. per pound East St. Louis, and Straits tin, at 49¾c. per pound, is virtually unchanged from a week ago. Among the minor metals antimony is steady at 10¼c. per pound for spot; cadmium is in excellent demand around 85c. per pound, with some contracts calling for sales above as well as below that figure. Quicksilver is easy, with little demand, at $123 per flask, and is featured by strong selling pressure from Europe.

Daily Prices of Metals

Nov.	Electrolytic Copper	Straits Tin	Lead		Zinc
	Refinery	New York	New York	St. Louis	St. Louis
1	15.775	49.75	6.50	6.30@6.325	6.25
2	15.75@15.80	49.75	6.50	6.30@6.325	6.25
3	15.775	49.75	6.50	6.30@6.325	6.25
5	15.775	49.25	6.50	6.30@6.325	6.25
6	Holiday	.....	...	.....	.....
7	15.775	49.75	6.50	6.30@6.325	6.25
	15.775	49.650	6.500	6.313	6.25

Average prices for calendar week ending Nov. 3, 1928, are: Copper, 15.754; Straits tin, 49.563; N. Y. lead, 6.500; St. Louis lead, 6.313; zinc, 6.250; and silver, 57.938.

The above quotations are our appraisal of the major markets for domestic consumption based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

Copper, lead, and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

In the trade, copper prices usually are quoted on a delivered basis: that is, delivered at consumer's plant. As delivery and interest charges vary with the destination, the figures shown above are net prices at refineries on the Atlantic seaboard. Delivered prices in New England average 0.225c. per pound above those quoted.

Quotations for copper are for the ordinary form of wire bars and ingot bars. For ingots an extra 0.05c. per pound is charged; for slabs, 0.075c.; and for cakes, 0.125c. up, depending on weight. Cathodes are sold at a discount of 0.125c. per pound.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York is now quoted at 0.35c. per pound above St. Louis, this being the freight rate between the two points.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

London

Nov.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3M	Spot	3M	Spot	3M
	Spot	3M							
1	68⅛	68 9/16	74¾	230⅜	224	21¾	21⅝	23 13/16	24¼
2	67⅞	68⅜	74¾	231	224½	21¾	21 11/16	23⅞	24¼
5	67 7/16	68	74½	229⅜	221¾	21 5/16	21½	24⅛	24 3/16
6	67 9/16	68 1/16	74½	230⅜	222¼	21 5/16	21 9/16	24¼	24¼
7	67½	68	74¾	231½	224⅜	21 5/16	21 9/16	24 3/16	24⅛

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

Nov.	Sterling Exchange "Checks"	Silver		Gold London	Nov.	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
1	4.84½	57⅝	26⅜	84s11½d	5	4.84 7/16	58	26¾	84s11½d
2	4.84½	58	26¾	84s11½d	6	Holiday	...	26 11/16	84s11⅜d
3	4.84 7/16	58	26 13/16	.....	7	4.84⅜	57¾	26⅝	84s11½d
						Ave.	57.875		

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command three-eighths cent premium.

Copper Steady at 16c.

Efforts of the copper producers to stem the tide of consumer buying and keep prices under control appear to have met success, at last. Fabricators appear to have taken to heart the frequently repeated assertion that no fear of an immediate "copper famine" should be entertained. Consequently the volume of sales reported by the various agencies during the week ending today is not far from average when consideration is given the holiday shortened week. This return to normal follows excessively heavy sales reports in the two preceding weeks. Foreign buying likewise has tapered off, largely as a result of unsettled local political conditions in one or two European countries. Copper Exporters, Inc., quote 16.25c. for electrolytic copper, c.i.f. usual European destinations.

Domestic sales have been for January delivery in large part. A fair tonnage of February metal has been sold, and in a few instances smaller lots for December and even for November delivery have changed hands. One very small lot for early November delivery in the Middle West brought a premium, selling at 16.25c., but such a special transaction is not indicative of higher prices, in general.

No Change in Domestic Lead Situation

No quotational change has occurred in the domestic lead market, though London weakened over the week end and is now quoted at £21 6s. 3d. for spot, compared with £22 a week ago. Should the decline there go much farther it seems probable that the price in New York would be affected, but so far no consideration is apparently being given to such a move. One buyer endeavored to get offers at a slight concession from recently quoted prices, but was unsuccessful. The slight weakness in London seems to be attributable to arrivals in somewhat larger quantity than usual.

The New York price is unchanged at 6½c., the level quoted by all sellers, and also representing the contract price of the American Smelting & Refining Company since Sept. 17. In the Middle West, quotations continue on a basis of either 6.325 or 6.30c., St. Louis, depending upon the seller, though there is now a slightly more general tendency to quote the lower end of the range than there was a week or two ago. Ample supplies for either November or Decem-

ber seem to be available at 6.30c., though where the seller has his production well sold, no concession from 6.325c. is being made. Most of the demand is for November shipment, though there have been several orders for prompt and three or four for December. The demand has been less than normal, though considerably improved over the total business of a week ago.

Zinc Unchanged at 6.25c.—Demand Fair

Galvanizers and other consumers of slab zinc appear on the verge of giving up in their long-drawn-out struggle to force the price of Prime Western below the 6.25c. per pound East St. Louis price basis. Business during the last week, though by no means comparable or even indicative of a major buying wave, has been considerably better than the average of recent months. A large part of the business reported has been for prompt or near-by shipment, indicating that consumers are maintaining stocks of slab zinc at as low a point as practicable. This makes the third successive week that improvement in the sales volume has been reported.

Tin Continues Close to 50c.

Though it is generally thought that the tin market is being more or less artificially sustained in London, through the buying up of surplus supplies of spot metal, there seems to be no expectation of much lower tin prices for some weeks to come. In fact, some tin-plate mills have contracted for their requirements until well into the new year. In the week ending today, the market has been rather quiet, though a reasonably good business is reported by some sellers. On Monday there was a pronounced weakening in London, which caused local prices to drop a half cent, but this loss was entirely temporary, and the market is now up to where it was, at 49¾c. for prompt Straits, with futures a quarter to three-eights of a cent less.

Silver Quiet but Steady

Silver remains quiet and featureless, with little change in prices as compared with the previous week. Small orders for China account with limited offerings have helped to steady the market. The tendency is uncertain.

Mexican Dollars (Old Mexican pesos): Nov. 1st, 43½c.; 2d, 3d and 5th, 43 7/8c.; 6th, holiday; 7th, 43 5/8c.

Foreign Exchanges Quiet

In general, the leading foreign exchanges have been quiet, with sterling declining somewhat. Closing cable quotations on Monday, Nov. 5, were as follows: Francs, 3.90⅝c.; lire, 5.23¼c.; and marks, 23.815c. Canadian dollars, 3/32 of 1 per cent discount.

Other Metals

Quotations cover large wholesale lots unless otherwise specified

ALUMINUM—Per lb., 99 per cent plus grades, price of leading interest, 24.30c. Outside market, 99 per cent plus, 24.30c.; 98-99 per cent, 23.90c.

ANTIMONY—Per lb., duty paid, New York: Chinese brands, 10¼c. per lb. for spot, 10c. per lb. for futures. Cookson's "C" grade, spot, 15⅜c.

BISMUTH—Per lb., New York, in ton lots, $1.70. Smaller lots, $1.85 and up.

CADMIUM — Per lb., New York: 70@95c.

IRIDIUM — Per oz., $280@$300 for 98@99 per cent sponge and powder.

NICKEL—Per lb. ingot, 35c.; shot, 36c.; electrolytic, 37c. (99.9 per cent grade) for single lots of spot metal.

PALLADIUM — Per oz., $42@$46. Small lots bring up to $50. Nominal.

PLATINUM—Official price quoted by the leading interest on small miscellaneous orders for refined metal, per oz., $78. Dealers and refiners quote the trade for refined metal, per oz., cash, for wholesale lots, $73.50@$74 bid, $75@$76 asked. Quiet.

QUICKSILVER — Per 76-lb. flask, $123, cash. Small lots command the usual premiums.

Prices of Cobalt, Germanium Oxide, Lithium, Magnesium, Molybdenum, Osmium, Radium, Rhodium, Ruthenium, Selenium, Tantalum, Tellurium, Thallium, Tungsten, and Zirconium are unchanged from the issue of Nov. 3.

Metallic Ores

TUNGSTEN ORE—Per unit of WO_3, N. Y.: Wolframite, $11; Western scheelite, $11.50. Nominal.

Chrome, Iron, Manganese, Tantalum, Titanium and Vanadium ores are unchanged from quotations in the Nov. 3 issue.

Joplin Ore Prices Unchanged

Joplin, Mo., Nov. 3, 1928

Blende	Per Ton
High	$42.55
Premium blende, basis 60 per cent zinc	$40.00@ 41.00
Prime Western, basis 60 per cent zinc	39.00@ 40.00
Fines and slimes, 60 per cent zinc	36.00@ 38.00
Average settling price, all zinc	38.83
Galena	
High	$87.50
Basis 80 per cent lead	85.00
Average settling price, all lead	84.09

Shipments for the week: Blende, 10,629; Lead, 2,337 tons. Value, all ores the week, $609,500.

Shippers have not loaded the full tonnage purchased, owing to an excess of moisture in the concentrates. All bins are open to the weather. Even when the weather is dry and clear the moisture content is from 3 to 6 per cent in coarse concentrates and as high as 10 to 13 per cent in the flotation product. The purchase this week is equivalent to a shipment tonnage for next week of 12,000 tons, to which may be added the tonnage not shipped last week.

Lead shipments continue to be larger than the production, with no relaxation of demand for all ore purchasable on the $85 basis price.

Platteville, Wis., Nov. 3, 1298

Zinc Blende	Per Ton
Blende, basis 60 per cent	$42.75
Lead Ore	
Lead, basis 80 per cent	$85.00

Shipments for the week: Blende, 760 tons; lead, none. Shipments for the year: Blende, 3,987 tons; lead, 1,570 tons. Shipments for the week to separating plants, 1,384 tons blende.

Non-Metallic Minerals

Amblygonite, Asbestos, Barytes, Bauxite, Borax, Celestite, Chalk, China Clay, Diatomite, Emery, Feldspar, Fluorspar, Fuller's Earth, Garnet, Gilsonite, Graphite, Greensand, Gypsum, Iron Oxide, Lepidolite, Limestone, Magnesite, Mica, Monazite, Ocher, Phosphate, Potash, Pumice, Pyrites, Quartz Rock Crystal, Silica, Spodumene, Sulphur, Talc, and Tripoli are unchanged from prices in the Nov. 3 issue.

Metallic Compounds

ARSENIOUS OXIDE (White Arsenic) Per lb., 4c. Quieter.

COPPER SULPHATE (Blue Vitriol)——Following a week of excellent buying in a usually quiet season, leading producers on Nov. 5 advanced prices to 5½c. per lb. in carload lots. Previous price had obtained since May 17.

Antimony Oxide, Calcium Molybdate, Sodium Sulphate (Salt Cake), Sodium Nitrate, and Zinc Oxide are unchanged from prices in the Nov. 3 issue.

Alloys

FERROMANGANESE—Per long ton, domestic and foreign, f.o.b. furnace or duty paid, port of entry, $105 quoted for last half, 1928. Spiegeleisen, 19@21 per cent, $33 f.o.b. furnace.

Ferrocerium, Ferrochrome, Ferromolybdenum, Ferrophosphorus, Ferrosilicon. Ferrotitanium, Ferrotungsten, Ferrovanadium, Monel Metal, Nickel Silver and Yellow (Muntz) Metal, are unchanged from prices in the Nov. 3 issue.

Rolled Metals

Copper, Lead and Zinc Sheets are unchanged from prices in the Nov. 3 issue.

Refractories

Chrome Brick, Fireclay Brick, Magnesite Brick, Silica Brick and Zirkite are unchanged from quotations in the issue of Nov. 3.

Iron, Steel, and Coke

Iron—Per gross ton, Valley furnaces, Bessemer, $18; basic, $17.50@$18; No. 2 foundry, $17.50@$18.

Steel—Base prices per gross ton, Pittsburgh, billets and slabs, $33@$34; plates, structural shapes, and soft steel bars, per lb., 1.90@2c.

Coke — Per gross ton, Connellsville furnace, $2.90@$3. Connellsville foundry, $3.75@$4.85. By-product coke, Ohio and Kentucky, $7; Buffalo and Detroit, $8.50@$9.

Mining Stocks—Week Ended November 3, 1928

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Anaconda	New York	90¼	87⅛	89	Oc.13, No. 19 Q	1.00
Ariz. Com'l	Boston	5	4½	4⅝	Jl. 16, Jl. 31 SA	0.25
Cal. & Ariz	New York	118½	112½	115	Se. 7, Se. 24 Q	1.50
Calumet & Hecla	Boston	44½	42½	42½	No. 30, De.15,Q	1.00
Cerro de Pasco	New York	105⅜	99½	100⅜	Oc.11, No. 1 Q	1.25
Chile Copper	New York	60	58½	58⅞	De.5 , De.29 Q	0.75
Con. Coppermines	N. Y. Curb	14⅜	13	13⅜		
Copper Range	Boston	23½	22⅜	23	Mr. 24, Ap. 20 A	1.00
Crystal Copper	Boston Curb	*25	*22	*25		
East Butte	Boston	4⅞	4⅜	4⅞	Dec., 1919	0.50
Granby Consol	New York	79⅜	75½	77	Oc.11, No.1 Q	1.00
Greene Cananea	New York	143	130½	134½	Se. 14, Oc.1 Q	1.00
Howe Sound	New York	67½	65	66	Se.29, Oc.15, Q	1.00
Inspiration Consol	New York	30½	29½	30¼	Apr. 1927 Q	0.25
Isle Royale	Boston	26½	24½	25½	Au.31, Se.15SAX	0.75
Kennecott	New York	126⅛	120½	122⅞	Au.31, Oc 1 Q	1.50
Magma Copper	New York	62	59	60½	Oc.1, Oc.15 Q	0.75
Mason Valley	N. Y. Curb	2	1⅞	2		
Miami Copper	New York	26⅜	24⅜	25½	No.1, No.15, Q	0.37½
Mohawk	Boston	51	45	46	Oc. 31, De. 1 Q	3.00
Montana-Idaho	Spokane	*13⅞	*11½	*13⅞		
Mother Lode Coal	New York	3⅜	3⅛	3⅛	Je.8, Je. 30, SA	0.15
Nevada Consol	New York	32⅜	30⅛	30⅜	Se.14, Se.29 Q	0.37½
New Cornelia	Boston	37⅛	34	34	No.2, No. 19 Q	0.50
Noranda	N. Y. Curb	58⅜	51½	54		
North Butte	Boston	5½	4½	4⅞	Oct., 1918	0.25
Ohio Copper	N. Y. Curb	*77	*70	*77	Sept., 1926	0.03
Old Dominion	Boston	15¼	14	14	Dec., 1918	1.00
Phelps Dodge	N. Y. Curb	193	180½	188	Se.10, Oc.1 Q	2.00
Quincy	Boston	44½	37	37	March, 1920	1.00
St. Mary's Min. Ld	Boston	35⅞	33½	34½	Ap.1928 A	2.00
Seneca Copper	New York	6½	5⅜	5⅜		
Shattuck-Denn	N. Y. Curb	18½	17⅜	17⅞		
Tenn. C. & C	New York	17¼	16⅜	16½	Au., 31 Se.15,Q	0.25
United Verde Ex	N. Y. Curb	24⅛	23⅛	23⅜	Oc.6, No.1 Q	0.50
Utah Copper	New York	210	200	210	Se.14, Se.29 Q	2.00
Utah Metal & T	Boston	1½	1⅜	1⅜	Dec., 1917	0.30
Walker Mining	Salt Lake	1.85	1.80	1.85		
NICKEL-COPPER						
Internat. Nickel	New York	195½	173⅜	189½	Se.10, Se.29 Q	0.75
Internat. Nickel pfd	New York	125	119½	125	Oc.1, No.1 Q	1.50
LEAD						
Gla stone Mtn	Spokane	*4⅞	*4¼	*4⅜	June, 1927	0.005
National Lead	New York	120	117	120	Se.14, Se.29 Q	1.25
National Lead, pfd. A	New York	142	142	142	No.3, De.15 Q	1.75
National Lead, pfd. B	New York	118	118	118	Oc. 19, No. 1 Q	1.50
St. Joseph Lead	New York	45¾	44⅛	44⅛	Se.8, De.20 QX	0.75
ZINC						
Am. Z. L. & S	New York	49⅜	43¾	44	May, 1917	1.00
Am. Z. L. & S. pfd	New York	107	101	101⅛	Nov., 1920	1.50
Butte C. & Z	New York	10½	8½	8⅝	De., 1926	0.50
Butte & Superior	New York	13⅛	11	11⅛	Se.14,Se.29 Q	0.50
Callahan Zn-Ld	New York	4	3½	3½	De., 1920	0.50
Consol.Lead&Zinc 'A'	St. Louis	11	10⅛	11	Je.25, Jl.1 Q	0.25
Eagle-Picher	Cincinnati	19	18⅜	19	No.15, De.1 Q	0.40
Eagle-Picher pfd	Cincinnati			100	July 15 Q	1.50
Evans-Wallower	N. Y. Curb	*9	*7½	*9		
New Jersey Zn	N. Y. Curb	231	227¼	231	No. 20, De. 10 X	2.00
Treadwell-Yukon	Toronto	13	11	12		
United Zinc	N. Y. Curb	*70	*60	*60		
Yellow Pine	Los Angeles	*25	*25	*25	Dec., 1925 QX	0.04
GOLD						
Alaska Juneau	New York	8	7	7⅛		
Ankerite	Toronto	*22	*22	*22		
Barry-Hollinger	Toronto	*40½	*35	*36½		
Central Manitoba	Toronto	*90	*80	*80		
Cresson Consol. G	N. Y. Curb	*95	*75	*94	Oct. 15, Q	0.02
Dome Mines	New York	8⅞	8⅛	8⅜	Se.29, Oc.20 Q	0.25
Gold Hill	Toronto	*9	*7	*7		
Golden Cycle	Colo.Springs	†1.63	†1.61		My. 31, Je.10 Q	0.04
Hollinger Consol	Toronto	9.60	8.90	9.00	Oc 17, No. 3 FW	0.05
Homestake Mining	New York	77	75½	77	Oc.20, Oc. 25 M	0.50
Kirkland Lake	Toronto	1.23	1.10	1.15		
Lake Shore	Toronto	21.00	20.50	21.00	Se.1, Se.15 XQ	0.20
McIntyre Porcupine	New York			20⅜	No.1, De.1 Q	0.25
Portland	Colo.Springs	†*17	*†14		Ap., 1927	0.02
Rand Mines	New York	36½	36½	36½	Au.21-28 Am.Sh	1.52
Sylvanite	Toronto	2.40	2.25	2.30		
Teck-Hughes	Toronto	8.80	8.50	8.60	Oc.17, No.1	0.15
Tom Reed	Los Angeles	*48	*44	*44	Dec., 1926	0.02
Tough-Oakes	Toronto	*16½	*11	*11		
Vipond Cons	Toronto	*71	*57½	*67	April, 1927	0.03
Wright-Hargreaves	Toronto	3.00	2.68	2.75	Oc.16, No.1 Q	0.02½
GOLD AND SILVER						
Carnegie Metals	N. Y. Curb	22⅜	22	22⅜		
Con. Cortez	N. Y. Curb	*20	*20	*20		
Dolores Esperanza	N. Y. Curb	*88	*86	*88	July, 1923	0.05
N.Y. Hond's Rosario	N. Y. Curb			16	Oc.17, Oc.27 QX	0.50
Premier Gold	N. Y. Curb	2⅜	2 1/16	2⅜	Se.14, Oc.4 Q	0.06
Tonopah Belmont	New York	*75	*75	*75	Oc., 1925	0.05
Tonopah Extension	N. Y. Curb			*7	Ap., 1925	0.05
Tonopah Mining	N. Y. Curb	3⅛	3⅛	3⅛	Se 29,Oc 20 SA	0.07½
West End Consol	N. Y. Curb	*3	*3	*3	Mar., 1923	0.05
Yukon Gold	Boston Curb	*72	*65	*65	June, 1918	0.02
SILVER						
Beaver Consol	Toronto	*80	*65	*65	May, 1920	0.03
Castle-Trethewey	Toronto	*38	*38	*38		
Coniagas	Toronto	2.60	2.60	2.60	May, 1924	0.12
Keeley	Toronto	*42	*42	*42	Mr.1, Mr.15 SA	0.04
Lorrain Trout Lake	Toronto			*50	July, 1925	0.05
Mining Corp. Can	Toronto	3.15	3.10	3.15	My.20, Je.13 SA	0.125
Nipissing	N. Y. Curb	3	2⅞	3	Se.29, Oc.20 Q	0.07½

Stock	Exch.	High	Low	Last		Last Div.
SILVER-LEAD						
Ahumada	New York	3⅜	3⅛	3⅛	Ap., 1927	0.12
Bingham Mines	Boston	49⅜	47⅛	47⅛	Se.20, Oc. 5 MX	0.50
Bunker Hill & Sullivan	N. Y. Curb			125	Oc. 31,No. 5 X	0.75
Cardiff M. & M	Salt Lake	*35	*32	*32	Feb. 5, 1927	0.10
Chief Consol	Salt Lake	4.12½	3.90	3.90	Ja.10, Fe.1 K	0.10
Consti'n Mng.&Mill'g	Spokane	*40	*38	*40		
Erupcion	Boston Curb	*27	*24	*24	Ja., 1928 Q	0.07½
Eureka Lily	Salt Lake	1.62½	1.57½	1.57½		
Federal M. & S	New York	159	156	159	Je., 1927	10.00
Federal M. & S. pfd	New York			101½	Au. 24, Se. 15 Q	1.75
Golconda	Spokane	*90	*84	*86½		
Hecla Mining	N. Y. Curb	16½	15⅞	16⅛	Au.15, Se. 1 Q	0.15
Highland-Surprise	Spokane	*13¾	*10	*12½		
Iron King Mining	Salt Lake	*95	*92	*93		
Keystone Mining	Salt Lake	*22½	*22½	*22½	Fe., 1926	0.07½
Lucky Jim	Spokane	*24½	*24	*24		
Lucky Tiger-Com	Kansas City	†6.75	†6.50		No.4, No.20 M	0.05
Mammoth Mining	Salt Lake	†1.35	†1.20		De., 1926	0.25
North Lily	Salt Lake	8.25	8.00	8.00	Oct., 20 I	0.20
Park Utah	New York	11	10⅛	10⅛	Se., 11, Oc.1 Q	0.20
Plutus Mining	Salt Lake	†2.00	†1.40		Ap.10, Ap.16 Q	0.10
Rico-Argentine	Salt Lake	*50	*49½	*50	June 15 Q	0.03
Sherman Lead	Spokane	*22½	*16	*22½		
Silver King Coal	Salt Lake	13.50	13.25	13.37½	Se.20, Oc.1 Q	0.25
Silversmith	Spokane	*10	*9	*9	Oct., 1926 Q	0.02
Strattons Mines	Spokane	1.39	1.30	1.37		
Sunshine M. Co	Spokane	1.30	1.30	1.30	June 20, K	0.02
Tamarack-Custer	Spokane	*41⅜	*39½	*41	Sept., 1924	0.25
Tintic Standard	Salt Lake	13.75	13.39½	13.62½	Se.19, Se.29 QX	0.30
Utah-Apex	Boston	3⅞	3½	3⅝	Jl.14, Au.1 K	0.25
IRON						
Bethlehem Steel	New York	67⅜	65⅜	66	Jl., 1924	1.25
Cleveland-Cliffs Iron	Cleveland	144	119½	140	Oc.15, Oc.25. Q	1.00
Colorado F & I, pfd	New York	71½	63	71½	Au.10, Au.25 Q	2.00
Gt. North'n Iron Ore	New York	30⅜	27½	28⅜	Ap. 9, Ap. 30 K	0.75
Inland Steel	New York	72½	70	70	No. 15, De.1 Q	0.62½
Republic I. & S	New York	81⅜	75⅜	76½	No. 14, De. 1 Q	1.00
Republic I. & S. pfd	New York	108	108	108	De. 14, Ja. 2 Q	1.75
Sloss-Sheffield S. & I	New York	114	114	114	Se.10, Se.20 Q	1.50
Sloss-Snef. S.&I. pfd	New York			104¼	Se. 20, Oc. 1 Q	1.75
U. S. Steel	New York	163⅜	159½	160⅞	No.30, De.29 Q	1.75
U. S. Steel, pfd	New York	142⅜	141	141⅜	No. 3, No.28 Q	1.75
Virginia I. C. & C	New York			25½	Jan., 1924	1.50
Virginia I.C.&C. pfd	New York	47	47	47	Je. 16, Jl. 2 SA	2.50
DIAMONDS, PLATINUM, ALUMINUM, VANADIUM, TIN						
De Beers Consol	New York			24½	Ju.16, Ju.26 K	0.97
So. Am. G. & P	N. Y. Curb	3⅛	3⅛	3⅛		
Alum. Co. of Amer	N. Y. Curb	140	135½	138		
Alum. Co. of Amer. pf	N. Y. Curb	107½	107½	107⅜	Se. 15, Oc. 1 Q	1.75
Vanadium Corp	New York	88½	83⅜	84⅞	De.1,De. 15 QX	1.75
Patino M. & E	New York	34⅜	33	34½	April, 1928	4s.
ASBESTOS						
Asbestos Corp	Montreal	23	22	22	Jan., 1926	1.50
Asbestos Corp. pfd	Montreal	80	75	75	Se.29, Oc 15 Q	1.75
SULPHUR						
Freeport Texas	New York	47⅜	45½	45½	Oc.15, No.1 QX	1.25
Texas Gulf	New York	71⅜	69⅜	70	Se. 1½, Se 15 Q	1.00
MINING, SMELTING, REFINING AND GENERAL						
Amer. Metal	New York	51	49⅜	49⅜	No. 20, De 1 Q	0.75
Amer. Metal, pfd. 6%	New York	112½	112½	112½	No.20, De.1 Q	1.50
Amer. Sm. & Ref	New York	275⅜	264	264⅜	Oc. 11, No.1 Q	2.00
Amer. Sm. & Ref. pfd	New York	138	136½	136½	No.2, De. 1 Q	1.75
Consol. M. & S	Montreal	290	285	289½	Je.30, Jl.16 SAX	6.25
Newmont Mining	N. Y. Curb	188	179½	183	Se.28, Oc.15 Q	1.00
U. S. Sm. R. & M	New York	60⅜	56½	56½	Oc.5, Oc. 15 Q	0.87½
U.S. Sm. R.&M. pfd	New York	54	53½	53½	Oc. 5, Oc. 15 Q	0.87½

*Cents per share. †Bid or asked. Q, Quarterly. A, Annual. SA, Semi-annually. M, Monthly. FW, four weeks. K, irregular. I, Initial. X, Extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, J. A. Hogle & Co.; Colorado Springs, Colo., Henry Sachs.

LONDON QUOTATIONS—WEEK ENDED October 23, 1928

Name	High	Low	Last	Date	Last Div. Amount
Alaska Mexican ($5)	35/6	35/—	35/—		
Alaska Treadwell ($25)	120/6	120/—	120/—	Nov., 1926	4 (d)
Aramayo Mines (25 frs.)	60/—	55/—	58/9	Aug., 1928	5 p.c. (†)
Burma Corpn. (10 rupees)	14/9	14/1½	14 6	Aug., 1928	6 annas*
Bwana M'Kubwa (5s)	8/—	6/9	7 10½		
Camp Bird (2s)	4/3	3/7½	3 10½	April, 1928	16⅔ p.c.
El Oro (£1)	5/3	4/9	4 9	Nov., 1924	2½ p.c.*
Frontino & Bolivia (£1)	10/—	8/6	10 —	July 1928	3¾ p.c.
Mexican Corpn.(£1)	10/6	10/—	10/6		
Mexico Mines of El Oro (£1)	35/—	30/—	30/—	Dec., 1926	3¾ p.c.*
Mond Nickel	168/9	128/1½	131/3	Aug., 1928	20 p.c.
Mount Isa (£1)	33 1½	31 3	33 1½		
N'Changa Copper Mining	19/6	½18/1½	19 3		
Oroville Dredging (£1)	3/9	3/6	3 9	Dec., 1923	3¾ p.c.
Rhodesian Congo Border (£1)	32/6	29/4½	32/6		
St. John del Rey (£1)	13/3	11/7½	12 3	April, 1928	7½ p.c.
San Francisco Mines (10s)	28/7½	28/1½	28/6	July 1928	12½ p.c.
Santa Gertrudis (£1)	15/3	14/6	14/9	July 1928	7½ p.c.
Selukwe (2s. 6d.)	8/6	7/9	8 3	April, 1917	6¼ p.c.
S. Amer. Copper (2s.)	2/4½	2/3	2 3	Nov., 1917	75 p.c.
Tanganyika (£1)	62/—	56/10½	61 10½	July 1928	5 p.c.
Union Miniere du Haut-Katanga (Brussels)	10,750	10,650	10,675	July, 1928	182.60 (b)

*Free of British income tax. †Swiss francs and plus 15 p. c. bonus. ‡Belgian frs. and free of taxation.